Milford Commuter Rail Extension Feasibility Study

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TABLE OF CONTENTS

LIST OF FIGURES AND TABLES vi

EXECUTIVE SUMMARY ES-1

1. INTRODUCTION 1

2. SERVICE AREA 3
- Communities to Be Served 3
- Existing Transportation Services 5

3. DESCRIPTION OF SERVICE 13
- Alignment 13
- Stations 14
- Layover Facility 16
- Running Times 18
- Levels of Service 21
- Fares 24

4. RIDERSHIP FORECASTS 27
- Potential Commuter Rail Market Groups 27
- Summary of Demand Estimation Method 28
- Ridership Forecasts by Trip Purpose and Destination 28
- Estimated Ridership by Town of Origin 30
- Estimated Diversions of Ridership from Other Transit Services 30
- Other Ridership Impacts on Franklin and Framingham/Worcester Lines 31
- Estimated Weekend Ridership 32
- Model-Based Ridership Forecast 33

5. CAPITAL COSTS 37
- Track and Signals 37
- Road Crossing Surface, Lights, and Gates 38
- Fencing 39
- Bridges 39
- Station Platforms and Shelters 40
- Parking 40
- Layover Facility 41
- Rolling Stock 41
- Summary of Capital Costs 42
- Capital Costs Relative to New Transit Ridership 43

6. OPERATING COSTS AND REVENUES 47
- Operating Costs 47
- Operating Revenues 49

Comparisons of Revenues and Operating Costs 51

7. OPERATIONAL ISSUES 55
Impact of Milford Extension on Other Commuter Rail Services 53
Impacts on Intercity Passenger Service 56
Impacts on Freight Service 58
Impacts at South Station 59

8. ENVIRONMENTAL AND COMMUNITY IMPACTS 61
Impacts on Air Quality 61
Impacts on Water Resources 63
Impacts on Community and Cultural Resources 63
Traffic Impacts on Major Arterial Routes 64
Traffic Impacts of Station Access 64
Grade Crossings 65
Impacts on Abutters 65

9. SUMMARY AND CONCLUSIONS 67

APPENDIX A - FURTHER DETAILS ON EXISTING PUBLIC TRANSPORTATION SERVICE IN STUDY AREA 71
Descriptions of Existing Bus Routes 71
Census and Survey Transit-Ridership Totals from Milford Corridor 72

APPENDIX B - DETAILS OF TRAVEL TIME COMPARISONS BETWEEN MILFORD EXTENSION AND EXISTING OPTIONS 75

APPENDIX C - CALCULATION OF ROLLING STOCK REQUIREMENTS FOR MILFORD EXTENSIONS 81

APPENDIX D - FURTHER DETAILS ON OPERATIONAL ISSUES 85
Impacts of Forge Park Extension on Route South of Readville 85
Impacts of Forge Park Extension on Route North of Readville 86
Impacts of Framingham Extension on Framingham/Worcester Line 88
Impacts at South Station 90

APPENDIX E - FURTHER DETAILS ON STATUS OF HOLLISTON SECONDARY TRACK RIGHT-OF WAY-IN MILFORD 93
Background of Abandonment and Partial Sale of Right-of-Way 93
Results of Right-of-Way Inspection 94
Evaluation of Commuter Rail Extension from Framingham to Central Street 95

APPENDIX F - ANALYSIS OF ALTERNATE STATION LOCATIONS 101
Role of Walk-In Potential in Station Site Selection 101
General Characteristics of Past Stations on Rail Routes to Milford 102
Locations of Past Milford Secondary Track Stations 102
Locations of Past Holliston Secondary Track Stations 103
Proximity of Potential Station Sites to Major Highways 103

APPENDIX G - RIDERSHIP ESTIMATION METHODOLOGY 107
Extension Share of Boston Proper Work-Trip Market at 1990 Travel Levels 107
Extension Share of Other Boston and Cambridge Work-Trip Markets at 1990 Travel Levels 108
Extension Share of Other Travel Markets 108
Estimated Ridership Without Express Service 110
Ridership Changes from 1990 to 1996 and Future Years 111

APPENDIX H - HISTORY OF MILFORD EXTENSION CORRIDOR PUBLIC TRANSPORTATION SERVICE 113
Past Rail Passenger Service 113
Past and Present Bus Service 117

LIST OF FIGURES AND TABLES

FIGURES

Service Area for Forge Park Extension 6
Service Area for Framingham Extension 7
Alignments of Present and Past Rail Routes to Milford 15

TABLES

2-1 Weekday Inbound Ridership at Present Commuter Rail Stations for Trips Originating in Milford Extension Service Area 9

2-2 Weekday Inbound Ridership on Present Mass Transit Services for Trips Originating in Milford Extension Service Area 11

3-1 Comparison of Projected Train Times to South Station from Stations on Milford Extension With Driving Times 22

3-2 Cost per One-Way Trip to Boston for Selected Rail and Bus Fare Options 24

4-1 1996 Estimated Weekday Inbound Ridership on Milford Extension From Forge Park or Framingham by Town of Origin 30

4-2 Comparisons of Ridership Estimates For Milford Extension From Forge Park From Manual Method and Regional Model 35

4-3 Comparisons of Ridership Estimates For Milford Extension From Framingham From Manual Method and Regional Model 36

5-1 Summary of Capital Costs for Milford Extension Alternatives and Forge Park Express Service Alternative 43

6-1 Cost and Revenue Comparisons for Milford Extension Alternatives and Forge Park Express Service Alternative 53

8-1 Milford Extension and Forge Park Express Alternatives Reduction in Average Weekday Auto Emissions 62

8-2 Milford Extension and Forge Park Express Alternatives Increase in Average Weekday Train Emissions 62

8-3 Milford Extension and Forge Park Express Alternatives Net Changes in Average Weekday Emissions 62

9-1 Summary of Performance Measures for Milford Extension and Forge Park Express Alternatives 70

EXECUTIVE SUMMARY

Direct rail passenger service to the town of Milford was last operated in 1959. At present, the nearest commuter rail stations to Milford are Forge Park/495 and Franklin/Dean College on the Franklin Line and Framingham on the Framingham/Worcester Line. Milford public officials and residents have recently expressed strong interest in reinstitution of commuter rail service to Boston from Milford, and have requested that the MBTA examine the feasibility of such service. This report presents the results of the feasibility study, which was performed for the MBTA by the Central Transportation Planning Staff (CTPS).

Project Description

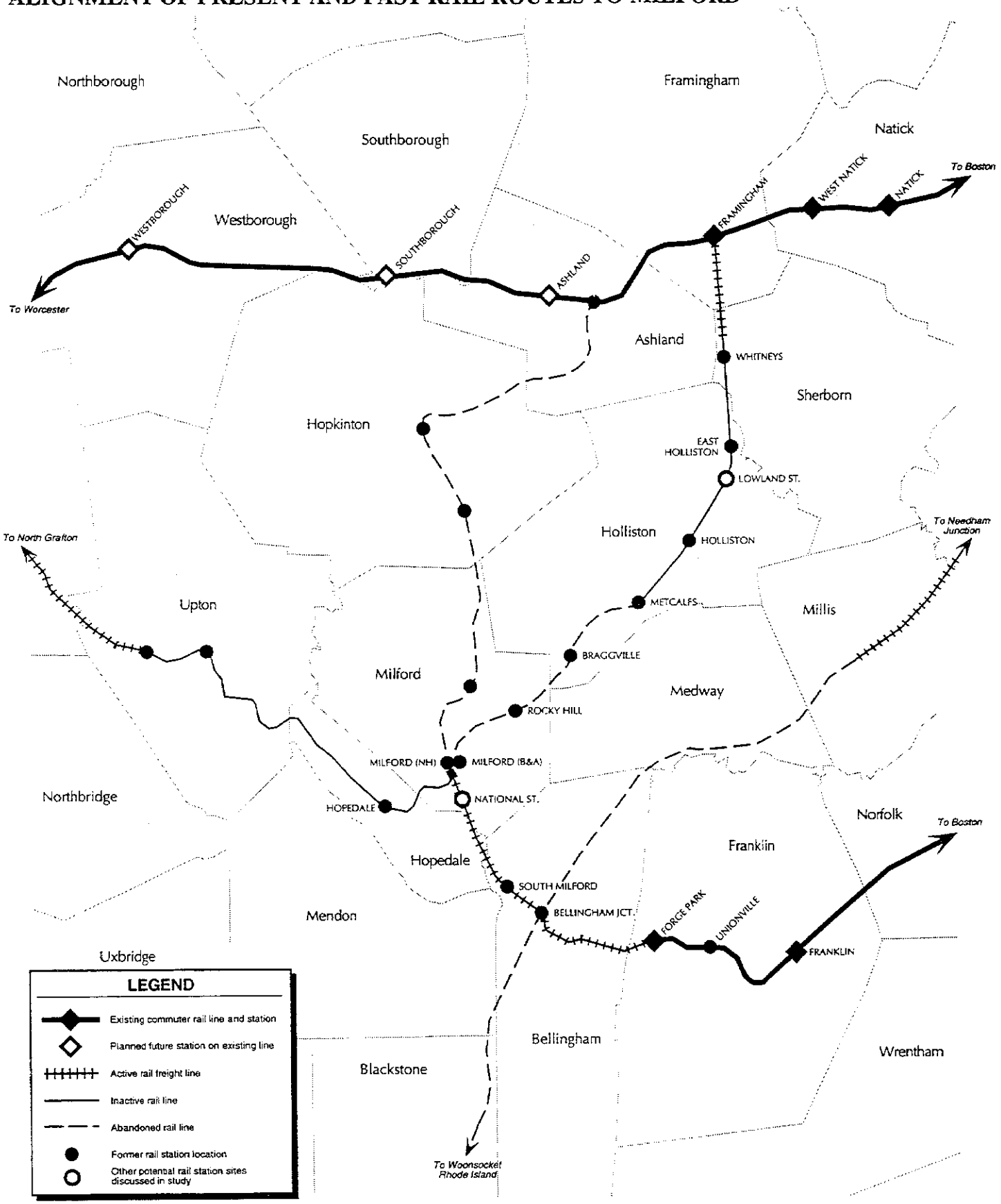
The study analyzed two alignments for a commuter rail extension to Milford. One of these is via a line known as the Milford Secondary track, which is a continuation of the present Franklin commuter rail line. This route would also pass through Bellingham. The other is via a line known as the Holliston Secondary Track, which branches from the present Framingham/Worcester commuter rail line at Framingham Station. This route would also pass through Sherborn and Holliston. In addition, the study analyzed new express train service to Boston from stations on the outer end of the Franklin Line without a Milford extension.

Three other rail routes that once served Milford directly or indirectly were ruled out as alignments for future commuter rail service. A line known as the Hopkinton Branch that formerly linked Milford with Ashland was ruled out because of sales of much of the right-of-way after the line was abandoned. A route to Milford using a combination of the Milford Secondary and the partially abandoned rail line between Bellingham Junction and Needham Junction was also ruled out because much of the right-of-way south of Millis has been obliterated. The Grafton & Upton Railroad, which connected Milford with North Grafton, is not suitably located for travel to Boston. The map on page ES-2 depicts all present and past rail lines into Milford.

The Milford Secondary Track is still an active rail freight line. The distance to Milford from Forge Park is about 6 miles. The Holliston Secondary Track is currently an active rail freight line for only about 2 miles at the Framingham end. An adjoining 5-mile section in Sherborn and Holliston is inactive, but not officially abandoned. The final 5-mile segment into Milford was abandoned in 1972, and ownership of the right-of-way is now fragmented. Because of redevelopment in the mile nearest the former downtown Milford station site, a commuter rail extension via this line would probably terminate near Route I-495.

Identification of specific station locations for reinstituted service would require further study. The demand analysis, and preliminary examination of present land use in the corridor, indicate that in addition to a terminal in Milford, an extension from Forge Park should include one station in Bellingham, near the former Bellingham Junction station

ALIGNMENT OF PRESENT AND PAST RAIL ROUTES TO MILFORD



site. An extension from Framingham should include at least one, and possibly two, stations in Holliston but should not include a station in Sherborn.

Based on rail distance from South Station, a Milford station on a Forge Park extension would be in fare Zone 8, but a station on a Framingham extension would be in Zone 7. Stations in Bellingham or the southern edge of Holliston would also be in Zone 7, but most sites in Holliston would be in Zone 6.

Ridership Potential

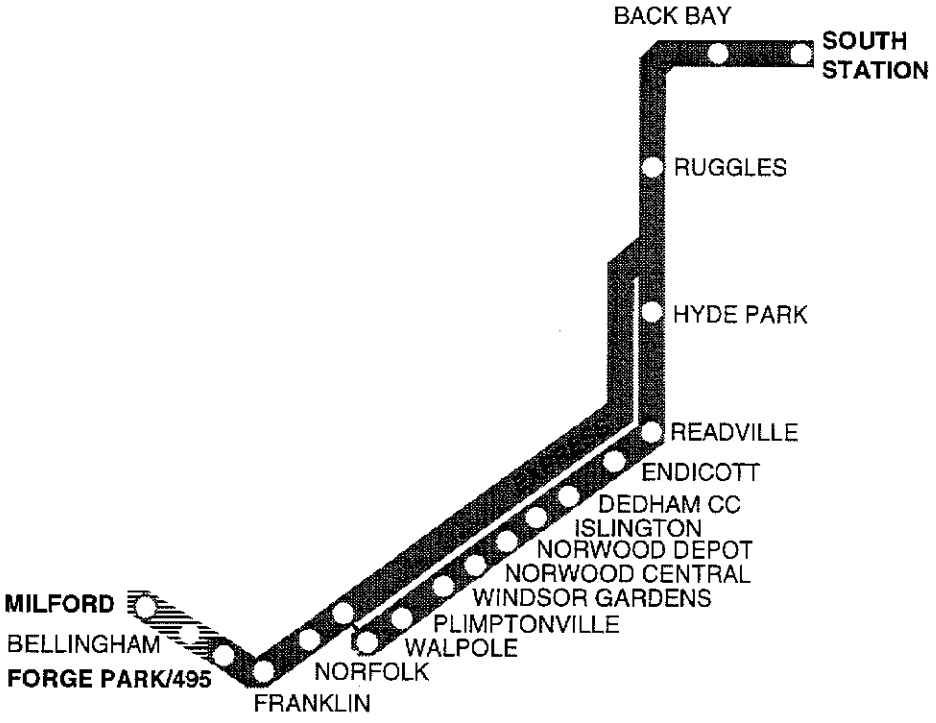
None of the towns that would have stations on a Milford extension are now served directly by any commuter rail line. Survey results show that residents of these towns use stations on the present Franklin or Framingham/Worcester lines, however. In addition to the towns served directly, a Milford extension on either alignment would serve some riders from the towns of Hopedale, Upton, Mendon, Uxbridge, and Douglas. An extension from Forge Park would also serve riders from Blackstone and from Woonsocket, Rhode Island, but an extension from Framingham would not. (See maps on pages 4 and 5.)

For an extension from Forge Park, ridership was estimated both for service with all trains making local stops on the present Franklin Line, and for service with peak-period Milford trains running non-stop between Walpole Station and Boston supplemented by local trains starting at Walpole. Ridership was also estimated for service with peak-period Forge Park trains running non-stop between Walpole Station and Boston supplemented by local trains starting at Walpole, but with no Milford extension. The express/local service configurations with and without a Milford extension are shown in the figures on pages ES-4 and ES-5.

On weekdays at present travel levels inbound boardings at stations on a Milford extension from Forge Park would range from 725 with local service only to 885 with peak-period express service. Only about 155 inbound riders under the local-service option would be new transit users. The express option would attract about 315 new inbound riders at extension stations and about 120 others at Forge Park, Franklin, Norfolk, or Walpole. These results are summarized in Table ES-1. Without a Milford extension, operation of peak-period express trains from Forge Park with local trains from Walpole would attract about 170 new inbound transit riders per day.

For a Milford extension from Framingham, ridership was estimated both for service with all trains making local stops from Framingham to Boston, and for service with peak-period Milford trains running non-stop between West Natick and Boston. Weekday inbound boardings at stations on the extension itself would range from 655 with local service only, to 855 with peak-period express service. The local-service option would attract about 205 new inbound transit users at extension stations and another 105 at stations on the Framingham/Worcester Line from Framingham east. The express-service option would attract about 405 new inbound transit users at extension

Express/Local Service Configuration with Milford Extension from Forge Park

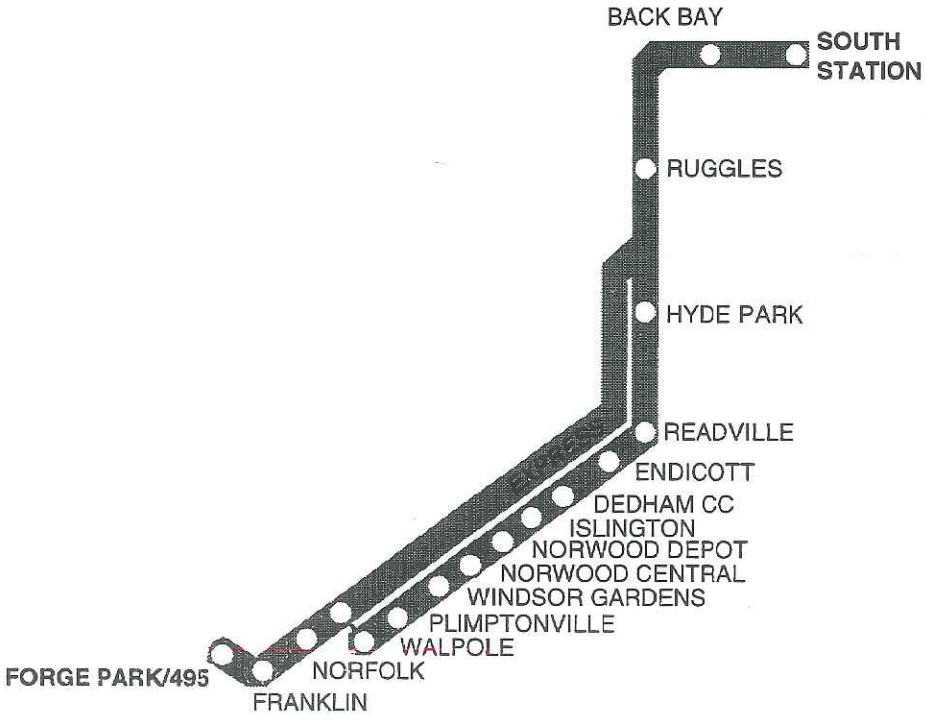


stations, and another 135 at stations on the Framingham/Worcester Line. These results are summarized in Table ES-1.

The predominant source of ridership on all MBTA commuter rail lines is work trips to Boston and Cambridge. These account for 85% of the total ridership on the present South Side lines. Based on the shares of work trips captured by these lines from communities at comparable distances from Boston, a Milford extension with unconstrained parking could be expected to capture about 50% of the work trips to Boston Proper and 20% to other parts of Boston or to Cambridge from its service area. The ridership estimates above were obtained by applying these mode share factors to 1990 Census tabulations of Boston and Cambridge employment for residents of each town in the extension service area, and adding allowances for other destinations and trip purposes.

Based on estimates from the Census Bureau, towns in the service area of a Milford extension had relatively small population growth between 1990 and 1996. Furthermore, as a result of economic conditions, overall Boston and Cambridge employment was essentially the same in 1996 as in 1990. Since work trips to Boston and Cambridge would be the predominant source of ridership on a Milford extension, it was concluded that forecasts based on 1996 conditions would not differ significantly from those using the 1990 data.

Express/Local Service Configuration on Franklin Line without a Milford Extension



Based on estimates by the Metropolitan Area Planning Council and the Massachusetts Institute of Social and Economic Research, total population in the Milford extension service area will increase by about 12 to 15% between 1990 and 2020. In the towns served by stations on the outer end of the Franklin Line where express trains from Milford or Forge Park would stop, overall population growth of nearly 50% is predicted. Assuming that commuter rail ridership will grow at the same rate as population in the service area, a Milford extension from Forge Park with all local service would attract about 180 new inbound riders per day by the year 2020. With peak-period express service, new transit ridership would total 555 including boardings on the Franklin Line. Forge Park express service without a Milford extension would attract 250 new transit riders by 2020.

A Milford extension from Framingham with all local service would attract about 335 new inbound riders per day by the year 2020, including boardings at stations on the Framingham/Worcester line. With peak-period express service, new transit ridership would total 590.

Capital Cost Estimates

Estimated capital costs for Milford extensions from Forge Park and from Framingham and for express service from Forge Park with no Milford extension are summarized in

Table ES-1
Milford Extension and Forge Park Express Alternatives
Estimated Weekday Inbound Riders by Category

Ridership Category	Milford Extension from Forge Park: All Local	Milford Extension from Forge Park: With Peak Express	No Extension: Forge Park Express and Walpole Local	Milford Extension From Framingham: To Rocky Hill All Local	Milford Extension From Framingham: To Rocky Hill With Peak Express
New Transit Users at Extension Stations	155	315	NA	205	405
Present Transit Users Diverted to Extension	570	570	NA	450	450
Total Boardings on Extension	725	885	NA	655	855
Additional New Transit Users at existing Stations	0	120	170	105	135
Total New Transit Users (present travel levels)	155	435	170	310	540
Total New Transit Users (year 2020 travel levels)	180	555	250	335	590

Table ES-2. It should be noted that these are based on a preliminary examination of the facilities needed, rather than on detailed engineering studies.

A Milford extension from Forge Park would use a rail line that is still used for freight service, but the track is in poor condition and would need to be entirely rebuilt to make it suitable for passenger service. Express service from either Milford or Forge Park would require reinstallation of the second track on about six miles of the present single-track segment of the Franklin Branch south of Norwood Central.

An extension from Framingham would be partly on a line that is still used for freight service, partly on a line that was used for freight service until about 1995, and partly on a line that was dismantled almost 25 years ago. Even the track that is still in place would need to be almost entirely rebuilt to make it suitable for passenger service.

Operating Cost and Revenue Estimates

Operating costs for a Milford extension would be determined primarily by the length of the route and the number of trips operated each day. For each extension alignment, costs were estimated for a service alternative that would include express trains during peak hours and for another that would include only local trains at all times. Operating costs for an extension from Forge Park were calculated as the difference between operating costs with the extension and those for the present Franklin Line service. Operating costs for a an extension from Framingham were calculated as the difference

Table ES-2
Summary of Capital Costs
for Milford Extension Alternatives
and Forge Park Express Service Alternative

Item	Milford (Central St.) Extension from Forge Park: All Local	Milford (Central St.) Extension from Forge Park: With Peak Express	No Extension Forge Park Express and Walpole Local Trains	Milford (Rocky Hill) Extension From Framingham: All Local	Milford (Rocky Hill) Extension From Framingham: With Peak Express
Total Capital Cost	$41,975,000	$98,535,000	$65,260,000	$74,615,000	$102,535,000
Capital Cost Per New Transit Rider (year 2020)	$233,194	$177,541	$261,040	$222,731	$173,788

Table ES-3
Cost and Revenue Comparisons
for Milford Extension Alternatives
and Forge Park Express Service Alternative

Item	Milford (Central St.) Extension from Forge Park: All Local	Milford (Central St.) Extension from Forge Park: With Peak Express	No Extension Forge Park Express and Walpole Local Trains	Milford (Rocky Hill) Extension From Framingham: All Local	Milford (Rocky Hill) Extension From Framingham: With Peak Express
Annual Operating Cost	$1,950,000	$4,130,000	$1,580,000	$7,190,000	$9,160,000
Incremental Fare Revenue	$355,000	$855,000	$285,000	$685,000	$1,080,000
Incremental Revenue/ Operating Cost	0.182	0.207	0.180	0.095	0.118
New Transit Riders (1996 travel levels)	155	435	170	310	540

between operating costs with the extension and those for the service that is otherwise anticipated on the Framingham/Worcester line after the full implementation of Worcester service.

Table ES-3 summarizes the incremental revenues and operating costs and revenue-to-cost ratios for four Milford extension service alternatives and for Forge Park express service without an extension. For either an extension from Forge Park with peak express service or express service without an extension, the results shown assume that the express trains would omit all Franklin Branch stops north of Walpole Station, where

separate local trains would originate. The revenue shown for each alternative is based on ridership at present travel levels.

Of the alternatives shown, a Milford extension from Forge Park with peak-period express service would have the highest revenue-to-cost ratio, at 21%. The ratios for an extension from Forge Park with local service only or for express service from Forge Park with no extension would be slightly lower, at about 18%. The ratios for both Framingham extension alternatives would be very low, at 10 to 12%. (In 1996 the ratio of revenue to operating cost for the existing MBTA commuter rail system as a whole calculated by methods comparable to those used for this study was about 42%.)

Environmental Impacts of Milford Extension

Impacts on Air Quality

Based on the present travel modes of the expected users of Milford rail service, and including new ridership on the Franklin Line resulting from operation of Milford service, a Milford extension with express service would reduce automobile vehicle miles of travel (VMT) by 30,115 per day. With local service only, the reduction would be 13,860. For express service from Forge Park without a Milford extension the VMT reduction would be 10,720 per day.

For an extension from Framingham with express service, the VMT reduction would be 27,425. With local service only, the reduction would be 18,430. Taking into account increased emissions from diesel locomotives used on Milford trains, the net impacts on air quality would be as shown in Table ES-4.

Table ES-4
Milford Extension and Forge Park Express Alternatives
Net Change in Average Weekday VMT and Emissions

	Milford (Central St.) Extension from Forge Park		No Extension Forge Park Express/Walpole Local Trains	Milford (Rocky Hill) Extension From Framingham	
Item	All Local	With Peak Express		All Local	With Peak Express
VMT Reduction	13,860	30,115	10,720	18,430	27,425
CO change	-132.7 kg	-282.1 kg	-96.3 kg	-161.7 kg	-241.4 kg
NOx change	+48.3 kg	+151.3 kg	+83.7 kg	+219.9 kg	+312.0 kg
VOC change	-10.8 kg	-21.0 kg	-5.9 kg	-9.1 kg	-13.7 kg
PM change	+1.0 kg	+2.5 kg	+1.2 kg	+3.3 kg	+4.6 kg

Other Environmental Impacts

A Milford extension on either alignment would not have any other significant adverse impacts on the environment. Bridges and other segments near water would be provided with appropriate drainage systems to prevent brake dust and oil from trains from entering waterways. Parking lots would likewise have drainage systems that would capture pollutants from automobiles.

Development along the right-of-way of an extension from Forge park is sparse, and no cultural resources would be impacted by Milford service. Only about 35 houses are within 200 feet of the route. An extension from Framingham would pass within a few hundred feet of schools at several locations. About 180 houses are within 200 feet of the Framingham route as far south as Rocky Hill.

A Milford extension on either alignment would not reduce traffic significantly on any highway. The maximum reduction would occur on the Mass. Turnpike east of Route 128, where auto diversions in the peak half hour would equal less than 2% of the capacity of the road.

Peak auto arrival rates at stations on a Milford extension would be much lower than those at all existing stations on the outer end of the Franklin Line. In the final minutes prior to departure of the most heavily patronized train, auto arrivals at the busiest station would average about 14 per minute, and these would not all arrive from the same direction.

An extension from Forge Park to Milford would have seven grade crossings of public roads, but none of them appear to be heavily traveled. An extension from Framingham to Rocky Hill in Milford would have 15 public grade crossings. The most heavily traveled of these would be Route 16 in Holliston and Routes 126 and 135 in Framingham. Traffic on these crossings ranges from about 10,000 vehicles per day on Route 16 to about 20,000 per day on Route 135.

Conclusions

A summary of the ridership and cost analysis results for Milford commuter rail extension alternatives and for Express service from Forge Park without a Milford extension is shown in Table ES-5. An extension to Milford from either Forge Park or Framingham would be feasible from an operations standpoint but would produce very limited benefits for the costs involved. The highest ratio of incremental revenue to incremental operating cost for any of the alternatives shown would equal about half that for the present MBTA commuter rail system as a whole.

All of the alternatives would have relatively high capital cost per new weekday transit rider. For comparison with the results in Table ES-5, the most recent estimate of the capital cost per new weekday transit rider in the year 2020 for the Worcester extension is $45,732. For the Newburyport extension, the figure is $93,055.

Table ES-5
Summary of Performance Measures for
for Milford Extension Alternatives
and Forge Park Express Service Alternative

Item	Milford (Central St.) Extension from Forge Park: All Local	Milford (Central St.) Extension from Forge Park: With Peak Express	No Extension: Forge Park Express and Walpole Local Trains	Milford (Rocky Hill) Extension From Framingham: All Local	Milford (Rocky Hill) Extension From Framingham: With Peak Express
Weekday Inbound riders at extension stations (1996 level)	725	885	NA	655	855
New Transit Riders at extension and existing stations (1996 level)	155	435	170	310	540
New Transit Riders at extension and existing stations (2020 level)	180	555	250	335	590
Annual Operating Cost	$1,950,000	$4,130,000	$1,580,000	$7,190,000	$9,160,000
Incremental Fare Revenue (1996)	$355,000	$855,000	$285,000	$685,000	$1,080,000
Incremental Revenue/ Operating Cost	0.182	0.207	0.180	0.095	0.118
Capital Cost	$41,975,000	$98,535,000	$65,260,000	$74,615,000	$102,535,000
Capital Cost Per New Transit Rider (year 2020)	$233,194	$177,541	$261,040	$222,731	$173,788
Weekday VOC Reduct. (1996 level)	-10.8 kg	-21.0 kg	-5.9 kg	-9.1 kg	-13.7 kg
Capital Cost/Kg of Weekday VOC Reduction	$3,886,574	$4,590,952	$6,487,288	$8,199,451	$7,484,307

1. INTRODUCTION

Direct rail passenger service to the town of Milford was last operated in 1959. At present, the nearest commuter rail stations to Milford are Forge Park/495 and Franklin on the Franklin Line and Framingham on the Framingham/Worcester Line. Milford public officials and residents have recently expressed strong interest in reinstitution of commuter rail service to Boston from Milford, and have requested that the MBTA examine the feasibility of such service. This report presents the results of the feasibility study, which was performed for the MBTA by the Central Transportation Planning Staff (CTPS).

In the past, through passenger service between Milford and Boston was operated on three different rail lines, and connecting service on two others. For reasons set forth below, only two of these lines (the Milford Secondary track and the Holliston Secondary Track) were analyzed in detail in the study as routes for future Milford passenger service. The map on page 15 depicts all present and past rail lines into Milford.

The only one of the rail lines to Milford that is still entirely active is the Milford Secondary Track, which links Milford with the end of the MBTA's Franklin Line at Forge Park Station.[1] This line is currently owned by Conrail, which operates local freight service on it. A planned sale of this line to an operator of regional rail freight systems, was recently canceled by Conrail as a consequence of the expected buyout of Conrail by the CSX and Norfolk Southern rail systems. Future ownership of the track will not significantly change the technical feasibility of operating passenger service on it, but could have an impact on the cost of purchase or lease of the right-of-way by the MBTA.

The Holliston Secondary Track, which formerly linked Milford with the MBTA's Framingham/Worcester Line at Framingham Station, was officially abandoned and dismantled between Milford and the Metcalfs section of Holliston in 1972. The abandoned right-of-way is mostly intact except in downtown Milford, however. Track on the rest of the line is still in place, but is mostly inactive. A separate study of converting the right-of-way of the Holliston Secondary into a bicycle path is now being conducted by the Metropolitan Area Planning Council (MAPC).

The New Haven Railroad Hopkinton Branch, which formerly linked Milford with the Framingham/Worcester Line in Ashland was abandoned gradually, beginning in 1938. The New Haven's Woonsocket Line, which formerly connected with the Milford Secondary at Bellingham Junction, was abandoned north of there beginning in 1941. Because of redevelopment of sections of the rights-of-way of the Hopkinton and

[1] For dispatching purposes, the entire rail line from Readville to Milford via Franklin is currently designated as the Franklin Branch. The older Milford Secondary designation is used in this study to distinguish the portion of the Franklin Branch between Franklin and Milford from that between Readville and Franklin.

Woonsocket lines, future restoration of rail service to Milford on either of these routes would be infeasible.

The Grafton & Upton Railroad (G&U) formerly linked Milford with the Framingham/ Worcester Line at North Grafton. The segment of the G&U in Milford has been inactive for many years, but it has never been formally abandoned and the track is still in place. A routing from Milford to Boston via North Grafton would be too indirect to compete with other travel alternatives. (A portion of the G&U right-of-way could be combined with one of the other routes from Boston to Milford to provide a further extension of passenger service west of Milford if this should prove to be desirable.)

2. SERVICE AREA

Communities to Be Served

The maps on pages 6 and 7 depict the service areas of a Milford commuter rail extension from Forge Park via the Milford Secondary Track and an extension from Framingham via the Holliston Secondary Track. These are the towns in which almost all passenger trips on each extension route would be expected to originate. Some riders would be attracted from towns outside of these service areas, but the total number of such riders would be insignificant compared with the number from within the service areas. The reasons for defining the service areas as shown are set forth below.

The majority of inbound passenger trips on existing MBTA commuter rail lines originate in the cities or towns served directly by those lines.[2] Most other trips originate in towns adjoining those with stations, but the outermost station on a line often attracts riders from greater distances than do the intermediate stations.

An extension from Forge Park would run through the towns of Franklin, Bellingham and Milford. For purposes of analysis, it is assumed that the extension would have no new stations in Franklin, because Forge Park Station in that town is only about 0.7 mile from the Bellingham town line. It is assumed that there would be one station each in Bellingham and in Milford. Residents of Franklin would have to travel further to reach either station on the extension than to reach Forge Park or Franklin Station, so Franklin is considered to be outside the service area of the extension.

Towns adjoining Bellingham or Milford to the north are Medway, Holliston, and Hopkinton. Milford is bounded on the west by Upton and on the south by Hopedale. Bellingham is bounded on the west by Mendon and Blackstone, and on the south by the city of Woonsocket, Rhode Island.

None of the cities and towns adjoining Milford or Bellingham now have direct rail passenger service. From Hopkinton, the planned station in Ashland on the Framingham/Worcester Line would have more convenient access than any station on a Milford extension. From Holliston, access to any station on an extension from Forge Park would require excessive backtracking compared with access to existing stations on the Framingham/Worcester Line. From Medway, access to a station in Bellingham or Milford would be less convenient than access to Forge Park. Rail time to Boston from Forge Park or from stations on the Framingham/Worcester Line would also be faster than times from stations on a Milford extension. Therefore, Hopkinton, Holliston, and Medway are considered to be outside of the service area of a Milford extension from Forge Park. The other cities and towns adjoining Bellingham or Milford are assumed to

[2]Results of the 1993 MBTA commuter rail survey show that on-line origins exceeded 67% on all but the Fairmount Line (65%) and the Attleboro/Stoughton Line (55%). The Attleboro/Stoughton Line has several large regional parking facilities near major commuting highways.

be in the service area, except that residents of the northern half of Upton would be likely to prefer the Ashland station.

The ability of a commuter rail line to attract riders from towns not served directly nor adjoining those served directly depends largely on the convenience of highway access to the stations on the line and proximity to stations on other rail lines. The only limited-access highway running directly through Milford is Route I-495. A Milford station would be less convenient than other existing or planned rail stations for residents of all other towns along I-495, however. Older state highways running through Milford that could provide station access are Routes 16, 85, 109, and 140. Routes 85 and 109 do not connect with any other towns for which a Milford station would be the most convenient choice. Route 140 links Milford with Grafton and Upton on the Northwest, but Grafton will soon have a station on the Framingham/Worcester line.

Towns to the west of Milford on Route 16 have relatively low Boston or Cambridge work-trip orientation. The first two towns on Route 16 west of Hopedale and Mendon are Uxbridge and Douglas. Towns west of Douglas would have faster access to Worcester Station via Route I-190 than to a Milford station. Ridership attracted to a Forge Park–Milford extension from towns other than those shown on the map on page 6 would be insignificant because of distance, lack of convenient highway access to stations, and low Boston work-trip orientation.[3]

A Milford extension from Framingham Station would run through the towns of Framingham, Sherborn, Holliston, and Milford. For purposes of analysis, it is assumed that Holliston would have one or two stations, and that Milford would have one. It is assumed that the extension would have no new stations in Framingham, because the Framingham/Sherborn town line is only about 1.25 miles from Framingham Station.[4] About two miles of the extension would be within the town of Sherborn, but as discussed in appendix F, there are no suitable sites for a station in that town.

The service area of a Milford extension from Framingham would be similar to that of an extension from Forge Park, but would also include Holliston and would exclude Bellingham, Blackstone, and Woonsocket. Holliston is bounded to the south by Medway and Millis, to the east by Sherborn, to the north by Ashland and Hopkinton, and to the west by Milford. None of these towns have direct rail service at present, but a station in Ashland on the Framingham/ Worcester Line is planned. This station will be more convenient for Ashland residents than any station in Holliston would be. For residents of Hopkinton, either the Ashland station or another planned station on the

[3]The town of Millville is bounded by three towns assumed to be in the service area of an extension from Forge Park, but none of the three would be served directly. Highway access from Millville to stations on the extension would be indirect, and 1990 Census figures show only about 30 Millville residents employed in all of Boston and Cambridge. For these reasons, Millville was not included in the assumed service area of the extension.

[4]The additional service frequency provided at the existing Framingham Station by Milford extension trains would attract some new riders to that station, but as discussed in chapter 4, this would represent a relatively small increase in the boardings there.

Framingham/ Worcester Line in Southborough would be more convenient than a station in Holliston. No station on a Milford extension would provide faster combined access and train times for residents of Sherborn, Medway or Millis than are provided by stations currently used by residents of these towns. For these reasons, Ashland, Hopkinton, Sherborn, Medway, and Millis are all considered to be outside the service area of a Milford extension.

Existing Transportation Services

Present Railroad Facilities In Service Area

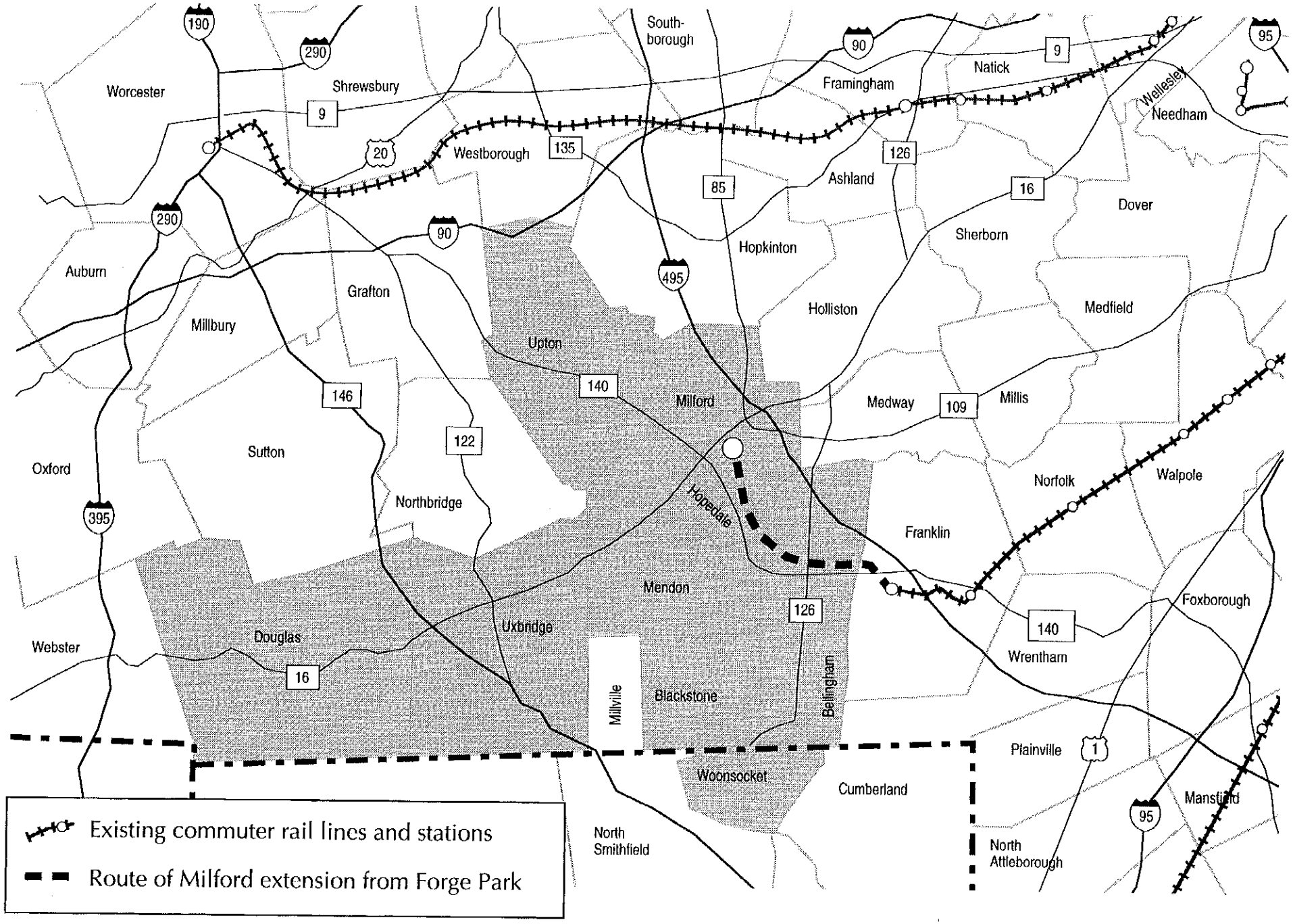
A Milford commuter rail extension from Forge Park Station would use the right-of-way of the Milford Secondary Track. This line is currently owned by Conrail, but has been leased to the MBTA since 1988, when passenger service was extended from Franklin Station to Forge Park. Conrail still operates local freight service on the Milford Secondary. A planned sale of this line to Railtex, Inc., an operator of regional rail freight systems, was recently canceled by Conrail as a consequence of the expected buyout of Conrail by the CSX and Norfolk Southern rail systems.

Passenger train service on the portion of the Milford Secondary between Forge Park and Bellingham Junction (near the center of Bellingham) was last operated in 1940. Passenger service on the segment between Bellingham Junction and Milford was last operated in 1920.

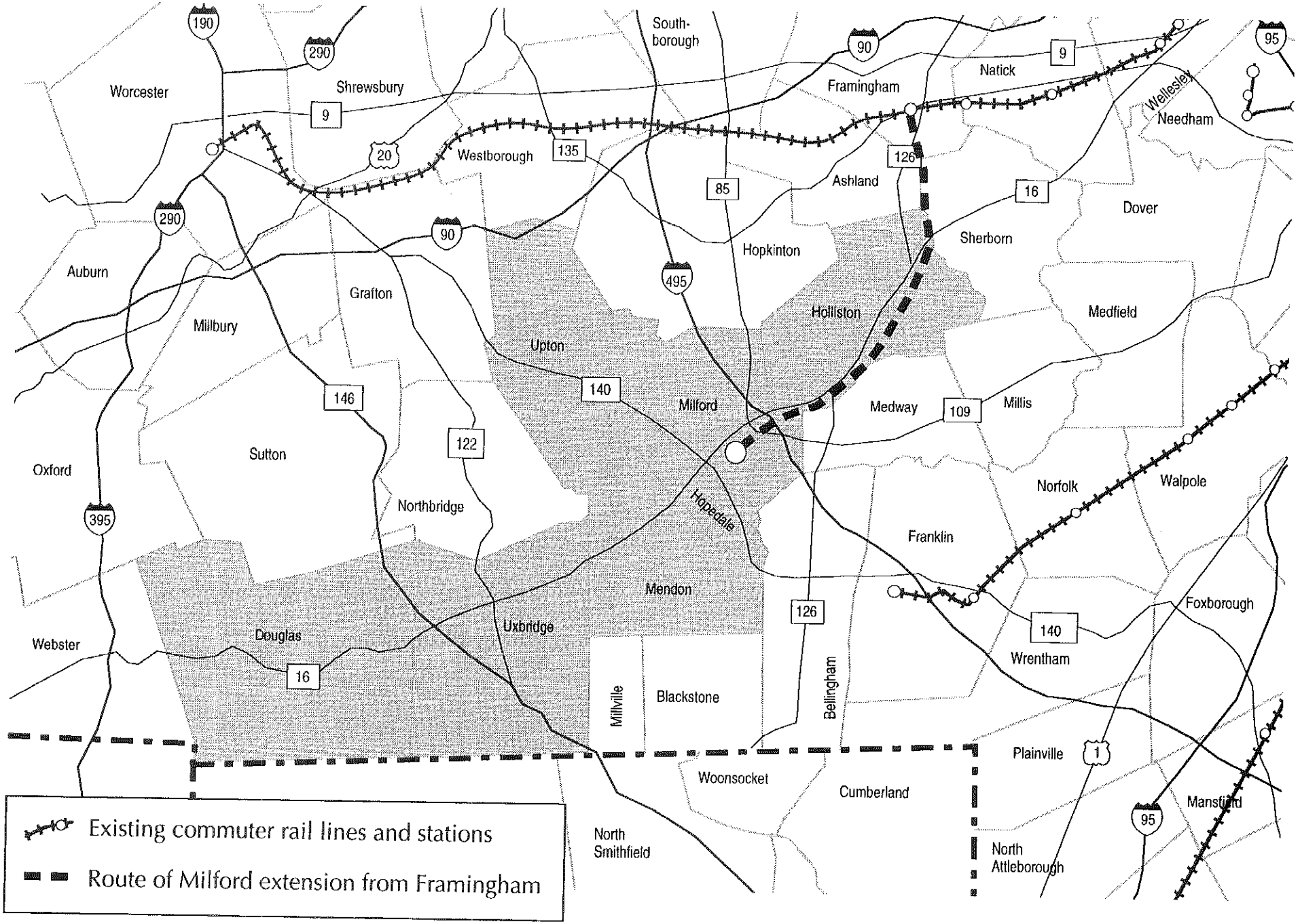
A Milford commuter rail extension from Framingham would use the right-of-way of the Holliston Secondary Track. Passenger service on this line was last operated in 1959. The segment of the Holliston Secondary between Framingham Station and the former Metcalfs Station in Holliston is owned by Conrail. Freight service is operated between Framingham Station and an automobile delivery yard at the former site of the General Motors assembly plant near the border of Framingham and Sherborn. The remainder of the line to Metcalfs has been out of service since about 1995 because of lack of demand. Conrail has expressed interest in selling the right-of-way to the state or a public agency. The segment of the Milford Secondary between Metcalfs Station and Milford was abandoned by its last operator, the Penn Central Company, in 1972. Some segments of the right-of-way were subsequently sold to developers or abutting property owners, with the required consent of the Executive Office of Transportation and Construction. As discussed in appendix E, these sales would make it difficult if not impossible to restore rail service all the way through to the old Milford Station site.

Another rail line, the Grafton & Upton Railroad (G&U), links Milford with North Grafton on the Framingham/Worcester commuter rail line. Passenger service on this line was last operated in 1928. The segment of the G&U between Milford and West Upton has been out of service for many years because of lack of demand. Passenger service from Milford to Boston via North Grafton would be too circuitous to attract riders. If passenger service were extended to Milford via another route, it could be further extended over part of the G&U if this should prove to be desirable.

SERVICE AREA FOR FORGE PARK EXTENSION



SERVICE AREA FOR FRAMINGHAM EXTENSION



Further details on an extension using part of the G&U and on the histories of all the rail lines in Milford are contained in appendix H.

Present Highway Facilities in Service Area

A Milford extension would be used predominantly for travel from communities in its corridor to Boston and Cambridge. The only limited-access highway serving Milford or Bellingham directly is Route I-495, which was designed primarily for circumferential travel around greater Boston rather than for radial trips to Boston. Holliston is not served directly by any limited-access highways.

The most direct driving routes between Milford, Bellingham, or Holliston and Boston are over old state highways with uncontrolled access and relatively low average speeds. Travel time runs have not been conducted over the full lengths of any of the routes. Despite its being less direct, the fastest driving route from either Milford or Bellingham to Boston is probably north on I-495 from Milford to Westborough and east on the Mass. Turnpike from there to Boston. Another alternative is to drive southeast on I-495 to Mansfield and north on I-95 and I-93 to Boston, but the inner segment of this route is more congested than the Mass. Turnpike. The fastest driving route from Holliston to Boston is probably north on Route 126 to Route 30 in Framingham to the Mass. Turnpike at Exit 13.

The older state highways serving travel to Boston from Milford or Bellingham are Routes 109 and 16. Route 16 also provides a direct route from Holliston, but Route 109 does not.

Route 109 connects in Dedham with Route 128 (I-95), which can be followed north to the Mass. Turnpike at Weston. Alternatively, drivers can continue on Route 109 beyond Route 128 to the VFW Parkway in West Roxbury. Drivers using Route 16 also have several choices for completing trips to Boston. These include Route 128 from Newton to the Mass. Turnpike in Weston, Route 9 from Wellesley to Boston, or Route 126 as described above from Holliston.

Present Public Transportation Serving the Study Area

Commuter Rail

At present, none of the towns that would be in the service area of a Milford extension from either Forge Park or Framingham are served directly by any commuter rail lines. Results of the 1993 survey show that most residents of these towns who use commuter rail board at stations on the Franklin or Framingham/ Worcester lines. Table 2-1 summarizes the expanded survey results for weekday inbound trips originating in the expected service area of a Milford extension. Of the origin towns shown, Bellingham, Blackstone, and Woonsocket would only be served by an extension from Forge Park, and Holliston would only be served by an extension from Framingham. All of the others would be served by an extension on either alignment.

Table 2-1
Weekday Inbound Ridership at Present Commuter Rail Stations for Trips Originating in Milford Extension Service Area

	Origin										
Boarding Station	Milford	Bellingham	Holliston	Hopedale	Mendon	Uxbridge	Douglas	Upton	Blackstone	Woonsocket, R.I.	Total
Franklin Line											
Forge Park	110	168		45	19	11	2	10	33	29	427
Franklin	18	8		4					16	16	62
Norfolk		4	2								6
Dedham Corporate Center			4								4
Subtotal	128	180	6	49	19	11	2	10	49	45	499
Framingham/Worcester Line											
Framingham	19		63					8			90
West Natick	2		27					3			32
Natick			5								5
Wellesley Square	1		18								19
Wellesley Hills			6								6
Wellesley Farms	3										3
Subtotal	25		119					11			155
Attleboro/Stoughton Line											
Route 128		5									5
Canton Junction		3								2	5
Sharon	3										3
Attleboro										5	5
Subtotal	3	8								7	18
Needham Line											
Needham Heights			1								1
Needham Junction			1								1
Hersey					4						4
Subtotal			2		4						6
Total	156	188	127	49	23	11	2	21	49	52	678

Notes: Bellingham, Blackstone, and Woonsocket are only in the service area of an extension from Forge Park. Holliston is only in the service area of an extension from Framingham.

A total of 262 weekday inbound commuter rail trips originated in the towns that would be served by both extension alignments. Another 289 originated in Bellingham, Blackstone, or Woonsocket, which would be served only by an extension from Forge Park, and 129 in Holliston, which would be served only by an extension from Framingham. This makes a combined total of 678 boardings from the service areas of either or both Milford extension alignments. Forge Park Station accounted for the largest share of these boardings, (427, or 63%) with Framingham a distant second (90 boardings, 13%).[5] Franklin was third, with 62 of the boardings (9%). The rest were scattered among many stations, with only West Natick (32) serving more than 4%.

Other MBTA Service

No MBTA rapid transit, light rail, or bus service is operated directly in any towns in the service areas of either Milford extension. The nearest boarding points for such service are Riverside Station (Green Line or express bus), Woodland Station (Green Line), and stations in Quincy on the Red Line. Survey results indicate that on a typical weekday about 30 residents of towns in a Milford extension service area drive to stations on the Green Line and about 20 to stations on the Red Line South Shore Branch. About 10 others (mostly from Holliston) board express buses at Riverside.

Private-Carrier Express Bus Service

Of the towns in the service area of either Milford extension, only Milford currently has through bus service to Boston. This consists of a route operated by the Brush Hill Transportation Company, with assistance from the MBTA/EOTC Interdistrict Transportation Service (IDTS) program. There are now two inbound A.M. peak and two outbound P.M. peak trips, with no off-peak or weekend service. This route also serves several towns along the state Route 109 corridor that would be outside a Milford extension service area.

Ridership figures for this route are not broken down by boarding or alighting location. As of 1996, ridership for the route as a whole was reported to average 55 passengers per day, or about 28 in each direction.[6] Based on older counts, it is likely that the majority of these board in towns other than Milford. (1990 Census Journey-To-Work figures show eight work trips by bus to Boston Proper, nine to the rest of Boston and none to Cambridge by Milford residents. These totals would have been expanded from only about two responses, however, so they are not reliable.)

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[5]Between the fall of 1993, when the survey was conducted, and March 1996, commuter rail Train Audit figures show increases of 35% in boardings at Framingham Station and 67% at West Natick . These increases are attributed to new express train service originating at Worcester, which began in 1994. With the same distribution of origins found in the 1993 survey, this would include about 50 additional riders from towns in the service area of a Milford extension. Because of parking constraints, however, disproportionate shares of the new riders would be expected to have trip origins nearer to the stations, within convenient walk-in or drop-off distances.

[6]A one-day count by CTPS in May 1997 showed only 17 Boston boardings on the two outbound trips. Of these passengers, 5 boarded at South Station and 6 each at Park Square and Copley Square.

Feeder Bus Service

In addition to the through bus route to Boston, Milford is served by a local bus route to Framingham via Holliston. This route is currently operated as part of the town of Framingham's Local Inter Framingham Transportation (LIFT) system, with assistance from the IDTS program.

At present, there are six round trips on this route on weekdays and five on Saturdays. One inbound A.M. peak trip and one outbound P.M. peak trip provide train connections at Framingham Station suitable for Boston commuting. It is also possible to transfer at Shopper's World from the Milford-Framingham bus to express service to Boston operated by Peter Pan Bus Lines, but the travel time for this option is much longer than via the commuter rail connection.

Ridership figures for the Milford-Framingham route are not broken down by boarding or alighting location. As of 1993, ridership for the route as a whole was reported to average 84 passengers per day, or about 42 in each direction. The 1993 commuter rail survey indicated that only about three inbound riders a day transferred from the Milford bus to trains at Framingham station, however. (All of these riders had outer trip ends in Milford.)

Table 2-2 summarizes weekday ridership on all present mass transit alternatives for trips originating in the combined service areas of commuter rail extensions to Milford from Framingham and from Forge Park.

Table 2-2
Weekday Inbound Ridership on Present Mass Transit Services for Trips Originating in Milford Extension Service Area

Existing Mass Transit Service	Riders from Milford Ext. Service Area
Franklin Commuter Rail	500
Framingham Commuter Rail	155
Green Line - Riverside or Woodland	30
Other Commuter Rail	25
Red Line - South Shore	20
MBTA Express Bus Route 500	10
Private-Carrier Bus (est.)	10
Total	745

3. DESCRIPTION OF SERVICE

Alignment

Extension from Forge Park

A commuter rail extension to Milford from Forge Park Station would use the Milford Secondary Track, currently owned by Conrail but under lease to the MBTA. This line runs from runs from Franklin Junction, near Franklin Station, through Bellingham to Central Street in downtown Milford. The present Franklin commuter rail line uses the easternmost 2.3 miles of the Milford Secondary between Franklin Junction and Forge Park Station. The remaining distance from Forge Park to the former Milford station site at Central Street is 6.2 miles. The total distance from this station site to South Station in Boston via Forge Park is 36.5 miles.

At one time, the Hopkinton Branch (discussed in greater detail in appendix H) provided an extension of the Milford Secondary north through Hopkinton to a connection with the Framingham/Worcester commuter rail line in Ashland. This extension was abandoned in several stages, beginning in 1938, and much of the right-of-way has been sold off. Historically, most passenger service to Boston from stations on the Hopkinton Branch was routed via Ashland rather than via Franklin because of the relative distances involved. A Milford extension from Forge Park could continue for some distance north of Central Street along the Hopkinton Branch right-of-way, but this was not considered for this study.

Extension from Framingham

A commuter rail extension to Milford from Framingham would use the former Boston & Albany Railroad Milford Branch, more recently known as the Conrail Holliston Secondary Track. This line diverges from the Framingham/Worcester commuter rail line just west of the Framingham Station platforms. At its maximum extent, it ran through Sherborn and Holliston to Central Street in downtown Milford.[7]

The distance from Framingham Station to Milford Station was 12 miles, making a total distance of 33.3 miles from Milford to South Station in Boston. This was the shortest rail route between Milford and Boston, being 3.2 miles shorter than the route via Franklin and 2.5 miles less than the route via Ashland.

A 4.8-mile segment of the Holliston Secondary, between Metcalfs Station in Holliston and Milford Station, was abandoned in 1972. Most of the track on this segment was subsequently removed, and parts of the right-of-way were sold to private owners. Some structures now block the former track location on the southernmost mile of this segment. For this reason, the analysis in this report assumes that an extension from

[7]When passenger service was still being provided, the Milford Secondary and Holliston Secondary tracks belonged to competing railroad systems and had separate stations on opposite sides of Central Street.

Framingham would terminate at a point between Routes I-495 and 109, identified for discussion purposes as Rocky Hill. (Issues related to an extension over the segment between Rocky Hill and Central Street are discussed in greater detail in appendix E.) At present, only about two miles of the Holliston Secondary at the Framingham end are still used, but the remainder of the line as far as Metcalfs Station is intact.

Stations

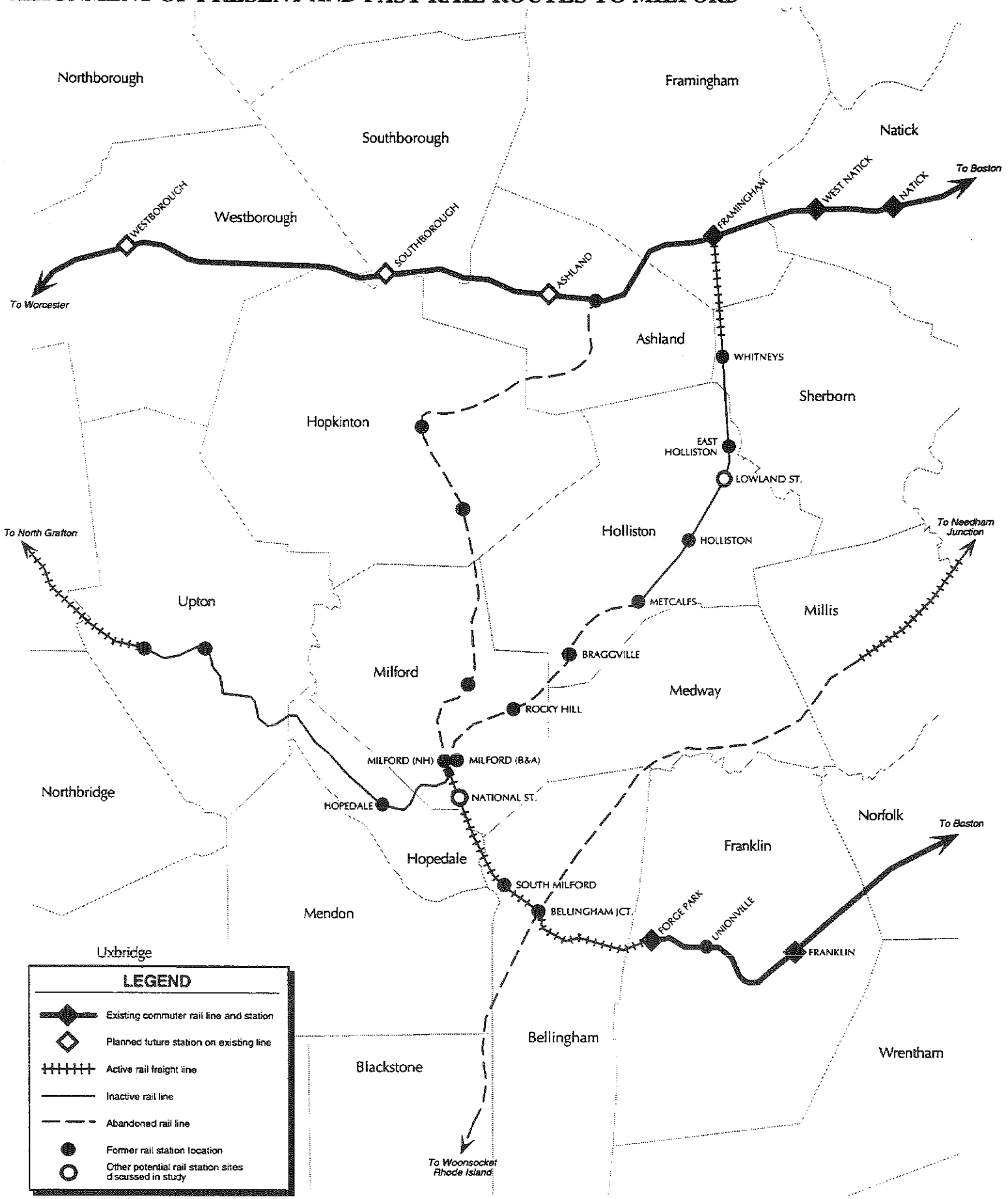
Identification of specific station sites on a Milford commuter rail extension is beyond the scope of this study. For purposes of analyzing ridership, travel times, and traffic impacts of the extension, however, it was necessary to make some assumptions about approximate station locations. Actual station locations would be unlikely to differ sufficiently from the assumed ones to change ridership projections significantly. As discussed further in appendix F, good highway access and adequate parking facilities would be critical to the success of a Milford extension, but most of the station sites used in the past lack one or both of these elements. Therefore, some new sites were considered as well. Of the sites considered, the most promising are discussed below. Other sites are discussed in appendix F. Past station sites and potential future sites on both extension alignments discussed in this report are shown on the map on page 15.

Stations on Extension from Forge Park

The analysis of a Milford extension for the 1994 MBTA Program for Mass Transportation (PMT) assumed that there would be one station between Forge Park and Milford, in Bellingham. A station in the vicinity of Bellingham Junction would have the best access of any site in Bellingham. For the present study, a Milford extension from Forge Park was assumed to include such a station. (Most of the land adjoining the right-of-way in this area was never railroad-owned, as the passenger and freight service facilities located there were relatively small.)

The former Milford station site on the Milford Secondary Track was on the south side of Central Street in downtown Milford. This location was 3.8 miles from Bellingham Junction and 6.2 miles from Forge Park. The station adjoined a small freight yard located on a triangular parcel bounded by the main track to the south and west, Central Street to the north, and Depot Street to the east. At present, this site is mostly vacant. The maximum dimensions are about 1,200 feet by 400 feet. Because of constraints imposed on this site by surrounding development, and potential traffic congestion problems in the downtown location, a new station site in an industrial area off Route 140 near National Street, about one half mile south of Central Street may be preferable for future service. Other former station sites on this line are described in appendix F.

ALIGNMENT OF PRESENT AND PAST RAIL ROUTES TO MILFORD



Stations on Extension from Framingham

A commuter rail extension from Framingham to Milford was studied for the MBTA in conjunction with the Worcester extension.[8] That study concluded that most of the former station sites on the line would be unsuitable as future station locations because of limited room for parking, or environmental problems. It was recommended that if such an extension were to be built there should be one station in Milford and two in Holliston. In Holliston, one station would be at Lowland Street, 4.6 miles from Framingham. The study was unable to identify a specific site suitable for the second station, but assumed for purposes of analysis that there would be one. In Milford, the station recommended in that study would not be downtown, but in a commercial area about 0.2 miles west of the former Rocky Hill Station location. This site is adjacent to state Route 16, and is about one half mile from the interchange of I-495 and state Route 109. In addition to allowing for more parking, terminating the line there rather than downtown would avoid use of the segment where the right-of-way has been partly obliterated by new development.

For purposes of analysis, the present study assumed that there would be one station in Milford and one or two in Holliston. In Milford, it was assumed that the most likely station site would be the new Rocky Hill location identified in the S&W study, but a full extension to Central Street is examined in appendix E. In Holliston, the Lowland Street site identified in the S&W study was assumed to be one of the station locations used. If there was a second station in Holliston, it would be near the former Braggville Station site at South Street.

Layover Facility

The rolling stock used on MBTA commuter rail lines does not necessarily require any special facilities at the end of a line. On single-track routes such as the Milford Secondary Track or the Holliston Secondary Track, trains can reverse direction at any desired location, with the engine pulling the train on the outbound trip and pushing it on the inbound trip or vice-versa. To minimize non-revenue train mileage, however, it is desirable to provide a yard for overnight storage of trains at or near the outer end of a route.

Present peak service on the outer end of the Franklin Line requires five train sets.[9] Three of these are based overnight at a layover facility 0.1 miles north of Franklin Station. Each set makes a non-revenue trip of 2.9 miles from the Franklin facility to Forge Park before its first inbound trip each day. Two sets based at the Franklin facility make non-revenue trips from Forge Park after their last outbound trips. The third Franklin set ends its last revenue trip at Franklin Station. Because of limited track capacity and insufficient room for expansion at Franklin, the other two train sets used in

[8]See Stone & Webster Civil & Transportation Services, Inc. *Commuter Rail Extension Feasibility Study Framingham to Worcester, Milford, & Marlborough. Final Report.* January 1990.
[9]The Franklin Line schedule referred to in this study had an effective date of May 12, 1997.

Franklin Line peak service are based at the Southampton Street yard in Boston. They are run out to Forge Park in one train before the start of the morning peak, followed closely by a third set used on an inbound trip prior to the peak. Although nominally in revenue service, these trains seldom carries passengers, as they leave Boston at 3:50 and 4:00 A.M. Elimination of either or both trips would have a negligible impact on ridership. After the P.M. peak, two train sets that end up in Boston return from Forge Park in a single revenue-service train. The last inbound trip of the day, which typically carries fewer than 10 riders, is also run with a set that ends up in Boston. In order for all train sets to end the day at the outer end of the line, it would be necessary to either eliminate two inbound trips or add two outbound evening trips.

If service to Milford were provided by extending the existing Forge Park trains, no additional train sets would be required, but some sets would need to be lengthened to accommodate new riders. With trains based at Franklin or Boston as at present, each non-revenue trip would be lengthened by 6.2 miles. Because of limited space in Milford, the most likely location for a new layover facility on an extension would be at a gravel pit in Bellingham about 1.5 miles west of Forge Park Station. The cost calculations in chapter 6 for the local service alternative assume that five Milford train sets would be based there. Each set would make one non-revenue trip of 4.7 miles between the Bellingham facility and Milford before its first trip of the day and another after its last trip. One of the early morning outbound trips from Boston and one of the evening inbound trips to Boston would be eliminated, and single train sets would be run on the two trips that now run with double sets. A Bellingham layover facility could also be used as the basing point for interim express service to Forge Park prior to construction of a Milford extension.

Express service to Milford would most likely take the form described in the PMT. During peak hours, trains originating at Milford would serve all stations as far as Walpole and then run non-stop to Boston. Additional trains originating at Walpole would serve all of the other stations. In off-peak hours all trains would serve all stations from Milford to Boston. This strategy would not change the number of train sets required to serve the outer end of the line compared with all-local service, but sets for all five peak trips and a morning pre-peak trip would be based at Bellingham.

Three additional train sets would be required for the Walpole short-turns. Depending on availability of space, these trains could be based either at Boston or at Bellingham. If the existing Franklin facility were retained after construction of the Bellingham facility, it could become the layover point for Walpole short-turns. Walpole is 19.1 miles from South Station, versus 12.7 miles from the likely Bellingham layover site or 8.3 miles from the Franklin facility. With equipment for Walpole trains based at Bellingham or Franklin, fewer non-revenue train miles would be required than with trains based at Boston, but the Bellingham and Franklin facilities would have to have combined capacity for three more train sets than needed for Milford service alone. (The calculations in chapter 6 assume the least-cost strategy of basing Walpole trains at Franklin.) Basing Walpole trains at Boston would offer more opportunities for improving equipment utilization by sharing train sets with other South Side routes. It

would also reduce the number of trains having to share the single-track segment of the Franklin Branch south of Walpole.

At present on the Framingham/Worcester Line, equipment for trains running through to Worcester is based at a layover facility near the Worcester station. Equipment for Framingham short-turns is based in Boston, as there is insufficient room for a layover facility in Framingham. At this writing, the schedule has three inbound trips starting from Framingham in the A.M. peak.[10] Equipment for two of these is run out from Boston in a single train before the start of the A.M. peak. Although nominally a revenue trip, this train carries few passengers because of the early departure time. The third set is run out during the A.M. peak, and does carry some reverse commuters. In the evening, the three Framingham train sets cover the last three trips of the day in each direction.

If service to Milford were provided by extending Framingham local trains, equipment could be based either at Boston as at present, or at a new layover facility on the extension. With equipment based at Boston, departure times of the first outbound trains would have to be at least 40 minutes earlier than at present to compensate for the extra running time from Framingham to Milford (Rocky Hill) and back. The distance from Boston to Milford would exceed the distances currently traveled each morning by Boston-based train sets on most existing lines.[11] Only the segment from Framingham to Milford would be added mileage, however.

Equipment for express trains from Milford to Boston could also be based at either end of the route. All revenue and non-revenue miles for these trains would be new, since they would be neither extensions of nor replacements for existing trips. With either local or express service, a maximum of four train sets would be based in Milford.

Running Times

Commuter rail service to Milford via either Forge Park or Framingham would operate partly on lines that currently have passenger service and partly on lines that are used for local freight service or are inactive. Because of deteriorated or missing tracks and structures, either extension alignment would require complete reconstruction of the segments not currently used for passenger service. An extension from Forge Park would need only 6.1 miles of track rehabilitation compared with 10.5 miles from Framingham to the new Rocky Hill site.

Running times on the new segments would depend on the number and locations of stations served, maximum speed limits, speed restrictions for curves and crossings, and the acceleration and deceleration characteristics of the rolling stock used. Milford trains

[10]The Framingham/Worcester Line schedule referred to in this study had an effective date of May 12, 1997.

[11]A Milford Station at the new Rocky Hill site would be 31.9 miles from South Station. The distance from South Station to Forge Park is 30.5 miles. The longest trip currently scheduled mainly for equipment placement is 43.6 miles from Boston to Providence.

run as extensions of existing Forge Park or Framingham trains would have the same running times as those trains between their present terminals. Milford express trains via the Holliston Secondary Track would have running times similar to present Worcester express trains on the segment between Framingham and Boston. At present, there are no express trains on the Franklin Line serving the same combination of stops assumed for Milford express trains via Forge Park. Running times for such trains were estimated for the 1994 PMT, however.

Historically, neither the Milford Secondary Track nor the Holliston Secondary Track ever had very high speed limits. From Forge Park to Milford, the maximum speed was 30 m.p.h. with a 15 m.p.h. restriction through a sharp S-curve at Bellingham Junction. From Milford to Framingham, the top speed was 35 m.p.h., with a 6 m.p.h. limit at the Rocky Hill grade crossing in Milford and a 10 m.p.h. restriction in the vicinity of Framingham Station. Because of curves and grade crossings, detailed engineering studies would be needed to determine the fastest feasible speed on either route. The Forge Park route also has an undulating profile, with no level segment longer then one half mile between Franklin Junction and Milford.

Table 3-1 summarizes estimated running times to Boston from stations on Milford extensions from Framingham or from Milford. These times are discussed in detail below for each route.

Estimated Times via Forge Park

When passenger service was extended from Franklin to Forge Park in 1988, the track on this segment was upgraded to a maximum speed of 40 m.p.h. Preliminary analysis indicates that the maximum feasible speed limit on the segment between Forge Park and Bellingham Junction would be about 45 m.p.h., with further restrictions of 35–40 m.ph. on two curves east of Route 126 in Bellingham and 25 m.p.h. on the curves at Bellingham Junction. The section between Bellingham Junction and Milford has fewer curves, so a maximum speed limit of about 60 m.p.h. would be feasible there. With these speeds, the travel time from Milford to Forge Park, including one intermediate stop at Bellingham Junction, would be about 10 minutes. The time from Bellingham Junction to Forge Park would be about 4 minutes. Because of the relatively short distances between stations, providing faster speed limits than those discussed above would have an insignificant impact on travel times.

The times calculated above agree with those assumed in the 1994 PMT analysis. Track capacity issues and constraints on parking expansion at existing stations could limit possibilities for adding express service to the Franklin Line, however. Therefore, it is uncertain what the most likely operating configuration for Milford trains would be between Forge Park and Boston.

In the PMT, the running time from Forge Park to South Station for trains running non-stop between Walpole and Ruggles was assumed to be 46 minutes, but this was based on a maximum speed limit of 70 m.p.h. north of Walpole. The present 60 m.p.h.

maximum and lower limits at some points would increase this to 48 minutes. Including dwell time at Forge Park, this would result in running times of 59 minutes to South Station or 54 minutes to Back Bay from Milford. Times from Bellingham Junction would be six minutes less than these.

Scheduled running times for current Forge Park trains vary with the number of stops and the dwell times at the stops. The fastest scheduled time is 54 minutes, for A.M. peak Train 704, which makes no stops between Norwood Central and Ruggles except for Dedham Corporate Center. The longest scheduled time is 67 minutes for Train 710, which stops at almost all stations and is one of the most heavily patronized trains on the route. The average for the five A.M. peak trains is 62 minutes.

If Milford trains were run as extensions of present trains rather than as part of new express service, the running time from downtown Milford to South Station would range from 65 to 78 minutes, with an average of 73. Times to Back Bay would be five minutes less, or 60 to 73 minutes, with an average of 68. Average times from Bellingham Junction would be 67 minutes to South Station or 62 minutes to Back Bay.

Estimated Times via Framingham

In 1950, the scheduled running time to Framingham from the old Rocky Hill Station site, about 0.25 miles less than the distance from the proposed new site, was 25 minutes. At the time, the top speed on the line was 35 m.p.h. and there were five intermediate stops between Rocky Hill and Framingham.

Unlike the Milford Secondary, the Holliston Secondary Track has few curves and is nearly level. The 1990 Stone & Webster study (cited on page 14 of this report) assumed that most of the Holliston Secondary could be upgraded for maximum speeds of 60 m.p.h. Lower speeds would be required only near the ends of the line. In Framingham, the segment adjoining the auto delivery yard at the former General Motors site would have a limit of 30 m.p.h. On the approach to Framingham Station north of Waushakum Street, the historic speed limit of 10 m.p.h. would be raised to 15 m.p.h.

With the speed limits above, the running time from new Rocky Hill to Framingham with one intermediate stop in Holliston would be about 17 minutes. The time to Framingham from Lowland Street in East Holliston would be about 9 minutes. At present, the scheduled running times for local trains from Framingham to South Station in the A.M. peak range from 47 to 49 minutes, with an average of 48. Including dwell time at Framingham and with one stop in Holliston, this would make an average time of about 66 minutes to South Station from Rocky Hill. The time to South Station from Lowland Street would be 58 minutes. Times to Back Bay would be 5 minutes less than times to South Station.

For Worcester trains running non-stop between West Natick and Back Bay, the present scheduled running time from Framingham to South Station is 35 minutes. This is 13 minutes less than the average scheduled time for a train making all stops. Therefore, a

Milford express train would have expected running times to South Station of about 53 minutes from Rocky Hill or 45 minutes from Lowland Street. With either express or local service east of Framingham, adding a Braggville stop would increase times from Rocky Hill or Central Street by about two minutes. Adding a Braggville station in Holliston would increase the running times from Rocky Hill by 2 minutes. (The time to South Station from Braggville would be about 65 minutes with local service or 52 minutes with express service.)

Based on the times above, the average travel time to Boston from Rocky Hill on a local train via Framingham would be 5 to 7 minutes less than that on a local train from Central Street via Forge Park. On an express train from Rocky Hill the time would range from 4 to 6 minutes less than time on an express train from Central Street via Forge Park. For most passengers who would use a Milford Station, however, the Rocky Hill site would be less convenient than the Central Street site. Rocky Hill would serve a much smaller walk-in market. Most passengers using a Milford station would have trip origins west of the Milford Town Hall, and their auto access times would be about 5 minutes less to Central Street than to Rocky Hill. Express service would also be more likely to be offered on an extension from Forge Park than on an extension from Framingham, because of greater capacity constraints on the line between Framingham and Boston.

Comparisons With Travel Times for Present Alternatives

Table 3-1 compares travel times to Boston from Milford, Bellingham and Holliston via commuter rail extensions from Forge Park or Framingham with times via existing alternatives. (These comparisons do not include access times to boarding stops or egress times from alighting stops.) Of the three towns that would have stations on one or both Milford extension routes, only Milford currently has through transit service to Boston. Milford also has feeder bus service to the Framingham commuter rail line, as does Holliston. Bellingham is not served directly by any mass transit routes at present. As shown in Table 3-1, travel times for express rail service would be competitive with driving times from all stations. Present drivers would perceive travel times on local rail service from most stations as insignificant improvements over existing options, however. Time comparisons for each of the towns on the two extension routes are discussed in greater detail in appendix B.

Levels of Service

The amount of service operated on existing MBTA commuter rail lines varies among routes. Service on a Milford extension, as on other lines, would be adjusted over time on the basis of ridership experience. Schedules of Milford trains would need to be coordinated with those of other trains operating on the shared route segments, as discussed in chapter 7 and appendix D. Schedules assumed for purposes of analysis on the two alternative routings are discussed below.

Table 3-1
Comparison of Projected Train Times to South Station
from Stations on Milford Extension
With Driving Times

Route and Station	Express Rail	Local Rail	Estimated Driving Time
Forge Park Extension			
Milford (Central St.)	59 minutes	73 minutes	52 minutes
Bellingham Jct.	53 minutes	67 minutes	57 minutes
Framingham Extension			
Milford (Rocky Hill)	53 minutes	66 minutes	49 minutes
Holliston (Lowland St.)	45 minutes	58 minutes	54 minutes

Times from Milford stations assume no Braggville station. With Braggville, these times would increase by two minutes each.

Extension via Forge Park

Service to Milford via Forge Park could be provided by extending trains now terminating at Forge Park or Franklin, by adding new limited-stop trains, or by running some combination of new and extended trains. The extension would be a direct continuation beyond the last station on the present route, so allocation of service between two diverging branches would not be an issue.

Theoretically, provision of service to Milford by extension of Forge Park trains would not change the frequency of service on the existing Franklin Line. Depending on the amount of new ridership attracted, however, it might be necessary either to add more trips over the entire route or to supplement Milford trains with short turnbacks from intermediate points. In any case, the departure times of some trains would have to be changed to allow for the additional running time between Forge Park and Milford. Most of the changes would occur in off-peak hours, as few train sets are scheduled to turn immediately from outbound to inbound trips at Forge Park during either peak period.

The current schedule for the Franklin Line has 16 weekday inbound trains originating at Forge Park. Of these, one arrives in Boston before the start of the A.M. peak, five arrive during the A.M. peak, and 10 arrive over the remainder of the day. Headways are not uniform, for a variety of reasons including operational constraints as well as demand patterns. Departure intervals range from 20 to 45 minutes during the A.M. peak and from 1 hour and 20 minutes to 2 hours during the rest of the service day.

The weekday outbound schedule has 15 trains terminating at Forge Park and one at Franklin Station. Four of the Forge Park trains and the Franklin train leave South

Station during the P.M. peak. Seven of the other trains run prior to the P.M. peak and four run after the end of the P.M. peak.

In addition to the Franklin and Forge Park trains, the Franklin Line carries one round trip from Boston to Walpole and one from Boston to Norwood Central during the A.M. peak and one Norwood Central round trip in the P.M. peak.

For purposes of analysis, it was assumed that Milford express trains running via Forge Park would serve all stations from Milford to Walpole, inclusive, then run non-stop to Ruggles. These trains would run every 30 to 35 minutes during peak hours. Short-turn trains from Walpole Station would serve all Franklin Line stations between there and Boston. The short-turns would also run on 30- to 35-minute headways. (Because of the faster running times of express trains between Walpole and Readville, it would be necessary for each local train to leave Walpole about 20 minutes ahead of the next express to prevent being overtaken). During off-peak hours all trains would run as locals between Milford and Boston.[12]

Extension via Framingham

Service on the Framingham/Worcester Line is currently in transition. Until September 1994, Framingham Station had been the outer endpoint for all commuter trains on this route. Phasing in of extended service from Framingham to Worcester began at that time. Increasing numbers of trains are being run through to Worcester as track and station improvements are completed. The tentative service plan when the extension is fully in operation calls for almost all trains to run to or from Worcester, with Framingham short-turns being operated only during morning peak hours. Under such a schedule, possibilities for serving Milford by extending trains that would be running anyway would be limited.

During A.M. peak hours, four local trains now planned to originate at Framingham could start instead at Milford without changing the schedule of Worcester trains. During P.M. peak hours, the most efficient strategy would entail diverting three outbound Worcester local trains to Milford and adding two new Milford trains. (The tentative schedule calls for the three Worcester local trains to leave Boston close behind Worcester express trains; most passengers for points west of Framingham will be likely to ride the expresses.)

During midday and evening hours, new trains from Milford could alternate with Worcester trains, increasing the frequency of service between Framingham and Boston to approximately hourly from approximately every two hours. An alternate strategy suggested in the Stone & Webster study would be to run shuttle trains between Milford and Framingham during off-peak hours, with passengers transferring to and from Worcester trains at Framingham.

[12]As at present, some lightly patronized stations would be skipped by some trains.

At present, the only trains that do not serve all stops between Framingham and Boston during peak hours are those originating at Worcester. This is also the most likely configuration after full implementation of Worcester service. Therefore, any Milford express trains would have to be in addition to Worcester and Framingham trains that would be run anyway.

Fares

MBTA commuter rail lines have a zone fare system. Zone limits are based nominally on mileage from Boston, but exceptions are made for reasons such as avoiding different fares at stations in the same town. Fare-payment options include single-ride or 12-ride tickets and monthly passes. (Survey results indicate that passes are used for an average of about 21 round-trips, or 42 rides, per month.) Senior citizens, children under the age of 12, high school or younger students, and persons with disabilities are eligible for half fares. Table 3-2 compares the cost per ride to Boston on existing mass transit services

Table 3-2
Cost per One-Way Trip to Boston for Selected Rail and Bus Fare Options

	Origin Town								
	Milford			Bellingham			Holliston		
Alternative	One-Way	12-Ride	Pass	One-Way	12-Ride	Pass	One-Way	12-Ride	Pass
Rail Extension Station									
Milford via Forge Park	$4.00	$3.33	$3.05						
Bellingham Jct. Sta.				$3.75	$3.13	$2.86			
Milford via Framingham	$3.75	$3.13	$2.86						
Holliston Station (Lowland Street)							$3.50	$2.92	$2.67
Existing Service									
Commuter Rail									
Forge Park or Franklin	$3.50	$2.92	$2.67	$3.50	$2.92	$2.67			
Framingham	$3.25	$2.71	$2.48				$3.25	$2.71	$2.48
West Natick or Natick							$3.00	$2.50	$2.24
Wellesley Sq. or Wellesley Hills							$2.50	$2.08	$1.95
LIFT Bus and									
Framingham Rail	$4.25	$3.61	$3.38				$4.25	$3.61	$3.38
Express Bus to Boston	$5.00	$3.60							

Notes: Costs shown above exclude parking fees
Commuter rail passes provide free transfers to connecting MBTA services.
Multiple-ride fare comparisons for LIFT bus are based on 20-ride tickets
Multiple-ride fare comparisons for express bus are based on 10-ride tickets

used by residents of the Milford commuter rail extension corridor with fares that riders would pay on the extension. Fares at extension stations are assumed to be the same as those from stations at similar distances from Boston on existing commuter rail lines. These fares are described in greater detail below.

Based on track distance from Boston, a Milford station on an extension from Forge Park would be in Zone 8, and a Bellingham Junction Station would be in Zone 7. In Zone 8, the respective costs per ride with a one-way ticket, 12-ride ticket or pass would be $4.00, $3.33, or $3.05. In Zone 7, these costs would be $3.75, $3.13, or $2.86.

The distance to Boston from Milford would be shorter via Framingham than via Forge Park. This would put any Milford Station on that line in Zone 7, with fares as listed above. A Braggville station in Holliston would also be in Zone 7. A Lowland Street station in Holliston would be in Zone 6, and the respective costs per ride with a one-way ticket, 12-ride ticket, or pass would be $3.50, $2.92, or $2.67.

Based on present practice, there would be a $1.00 per day parking fee at any station on either Milford extension route. For a passenger driving alone to the station, this would effectively add 50 cents to each of the one-way trip costs listed above.

Comparisons with Fares for Present Transit Alternatives

Among residents of Milford and Bellingham, the most commonly used mass transit service for travel to Boston or Cambridge is the Franklin commuter rail line. Most riders from these towns board at Forge Park Station, with the most common access mode being park-and-ride. Forge Park Station was originally in fare Zone 7. Effective May 1, 1996, it was changed to Zone 6, to eliminate the differential with Franklin Station. The purpose of this change was to try to shift excess parking demand from Franklin to Forge Park. (To the extent that this has succeeded, the proportion of boardings at Forge Park would now be even higher than indicated in Table 2-1.) The Zone 6 fares are the same as those shown above for a Lowland Street station in Holliston. The parking fee at either Forge Park or Franklin Station is $1.00 per day.

Among Holliston residents, the most commonly used mass transit service for travel to Boston or Cambridge is the Framingham/Worcester commuter rail line. The 1993 survey results showed boardings by Holliston residents divided among several stations, with Framingham Station accounting for about half of them. (Some Milford residents also used Framingham Station.) Framingham Station is in fare Zone 5. The respective costs per ride from there with a one-way ticket, 12-ride ticket or pass used for 21 round trips per month are $3.25, $2.71, or $2.48.

The MBTA parking lot at Framingham Station has a $1.00 per day parking fee. Because of limited capacity in this lot, however, the majority of park-and-ride passengers boarding at Framingham Station use private lots, where fees vary.

On the LIFT bus connection to Framingham Station, the fare from any stop in Milford or Holliston is $1.00 with a one-way ticket, or 90 cents per ride with a 20-ride ticket. (The 1993 survey results showed negligible use of this option.)

After Framingham Station, the most common boarding location for Holliston residents is West Natick, in Zone 4. The respective costs per ride from there with a one-way ticket, 12-ride ticket or pass used for 21 round trips per month are $3.00, $2.50, or $2.24. The parking fee is $1.00 per day. A few Holliston residents use Natick Station, which is also in Zone 4. Parking there is in town-owned metered spaces, with the fee depending on the duration of the stay.

Most other Holliston residents board either at Wellesley Square or at Wellesley Hills. Both of these stations are in Zone 3. Costs per ride from these stations with a one-way ticket, 12-ride ticket or pass used for 21 round trips per month are $2.50, $2.08, or $1.95. Parking for both stations is in town-owned metered spaces, with the fee depending on the duration of the stay.

The present through bus route from Milford to Boston offers a choice of one-way tickets, at $5.00 each, or ten-ride tickets, which lower the cost per ride to $3.60. The buses make two stops at shopping plazas in Milford where free parking is available. Including parking costs, a monthly pass rider boarding at a Zone 8 commuter rail station in Milford would pay an average of $3.55 each way per day, or 5 cents less than the least costly bus fare. From a Zone 7 station, the saving would be 24 cents per trip. Relatively few Milford residents currently use the buses, however. None of the other towns in service area of a Milford extension on either alignment have direct bus service to Boston at present.

Potential Commuter Rail Market Groups

Boston and Cambridge Work and Non-Work Trips

Based on the travel patterns on the existing Boston commuter rail system, the vast majority of riders on a Milford extension via either alignment would use the service for peak-period work trips to Boston or Cambridge. On the commuter rail lines now terminating at South Station, 95 percent of all final trip destinations are in either Boston or Cambridge, and 89 percent of these are home-to-work trips. Otherwise stated, home-to-work trips ending in these two cities account for 85 percent of all South Side commuter rail ridership. Over 95 percent of the home-to-work trips on South Side commuter rail lines are made on A.M. peak trains, defined as those scheduled to arrive at South Station between 6:30 and 9:30.

For rail trips now originating in towns that would be served directly by a Milford extension, the distributions of destinations and trip purposes are very similar to those for overall South Side ridership. The 1993 survey results showed that for trips originating in Milford alone, 98% of destinations were in Boston or Cambridge, and 89% of these were home-to-work trips. For trips originating in Bellingham, 99% of destinations were in Boston or Cambridge, and 88% of these were home-to-work trips. For trips originating in Holliston, 93% of destinations were in Boston or Cambridge, and 97% of these were home-to-work trips.

Within Boston, the commuter rail market share is highest for trips ending in Boston Proper, defined approximately as the area bounded by Massachusetts Avenue, the Charles River, Boston Harbor, Fort Point Channel, and the Southeast Expressway. The 1993 survey found that 90% of the Boston work trip destinations on South Side commuter rail lines were in Boston Proper. In contrast, 1990 Census figures showed that only about 55% of *total* Boston work trip destinations (all modes of travel) from the cities and towns served directly or indirectly by these rail lines were in Boston Proper. Rail work trip destinations to Boston locations outside Boston Proper were concentrated most heavily in neighborhoods bordering on Boston Proper, with 92% going either to the Fenway/Parker Hill area, South Boston, Charlestown or North Dorchester.

Other Destinations and Trip Purposes

Work trips account for a much higher proportion of commuter rail trips destined for Boston or Cambridge than of those destined for other locations. In the survey results, of the 5% of South Side rail trips with destinations outside Boston or Cambridge, only 40% (or 2% of the total ridership) were work trips.

Among South Side rail trips with destinations outside Boston or Cambridge, almost all involve traveling into Boston and transferring from commuter rail to other modes. Interzone ridership (i.e. trips between two stations on the same line excluding South

Station, Back Bay, or stations in fare zone 1A or 1B) accounts for under 1% of weekday trips. This may, however, be more a reflection of the locations of rail stations relative to suburban trip attractions than of inherent unattractiveness of commuter rail for suburb-to-suburb travel. For reasons detailed in appendix G, interzone ridership was assumed to account for 0.4% of all boardings on an extension from Forge Park, but for 2.5% of boardings on an extension from Framingham.

A Milford extension could also serve some reverse-commuting trips, but based on the experience on existing Boston commuter rail lines, these would not be a significant ridership component. This is discussed further in appendix G.

Summary of Demand Estimation Method

Ridership forecasts for a Milford extension were prepared using a manual forecasting method described below and in appendix G. Separate forecasts prepared using the CTPS regional demand model were consistent with these. (The model-based forecasts are discussed at the end of this chapter.) Total work travel from each town in the extension corridor to Boston Proper, the rest of Boston, and Cambridge was determined from the 1990 U.S. Census Journey-to-Work reports. Estimates of the shares of this travel that a Milford extension could be expected to capture were made on the basis of information for existing commuter rail lines in the Census reports and in the 1993 MBTA commuter rail survey.

Non-work travel to Boston and Cambridge destinations via a Milford extension was estimated by adding factors derived from survey results to the work trip estimates. Ridership to destinations outside Boston and Cambridge was likewise estimated by applying factors to Boston and Cambridge ridership.

The Journey-to-Work figures used in making the ridership forecasts described above were taken from the 1990 Census. Estimates prepared by the Census Bureau indicate that overall population in the Milford extension service area increased by about 7.5% between 1990 and 1996. Combined population in the towns that would be served directly, and would account for the largest shares of ridership, increased by under 2%, however. As a result of economic conditions, overall Boston and Cambridge employment was essentially the same in 1996 as in 1990. Since work trips to Boston and Cambridge would be the predominant source of ridership on a Milford extension, it was concluded that forecasts based on 1996 conditions would not differ significantly from those using the 1990 data. Ridership projections for the years 2010 and 2020 were made using factors based on a combination of data from the Census Bureau, the Metropolitan Area Planning Council, and the Massachusetts Institute of Social and Economic Research.

Ridership Forecasts by Trip Purpose and Destination

Ridership was estimated for each of the two alignments under consideration (via Forge Park and via Framingham) and for the two service levels considered for each alignment

(express trains during peak hours with local trains in off-peak hours or local trains at all times.) The results are summarized in Table 4-1. With similar service levels, an extension from Forge Park would serve slightly more total riders than an extension from Framingham, but an extension from Framingham would serve more new transit riders. Because of capacity constraints, express service would be less likely to be provided on an extension from Framingham than on an extension from Forge Park, however.

Forecasts for Extension from Forge Park

Based on the ridership forecasting methods discussed above and in appendix G, at current travel levels, an extension from Forge Park with only local service at all times would serve 345 weekday inbound boardings at Milford and 380 at Bellingham Junction, for a combined total of 725. Of these, about 615 would be work trips to destinations in Boston or Cambridge, 75 would be non-work trips to Boston or Cambridge, and 35 would be trips to other destinations for all purposes. Population and employment projections indicate that ridership would change little in future years, increasing to about to 810 in the year 2020. (The totals above do not include passengers carried between pairs of stations on the present Franklin Line by Milford trains. Such ridership is discussed later in this chapter.)

With express service in peak hours, ridership at current travel levels would increase to 445 weekday inbound boardings at Milford and 440 at Bellingham Junction, or a combined total of 885. Of these, about 750 would be work trips to destinations in Boston or Cambridge, 95 would be non-work trips to Boston or Cambridge, and 40 would be trips to other destinations for all purposes. Of the latter, only about 5 would be interzone trips to stations on the Franklin Line; the rest would be trips through Boston or Cambridge to points not served directly by Milford trains. Total boardings would increase to about 1,010 in the year 2020.

Forecasts for Extension from Framingham

On a two-station extension from Framingham with local service at all times, ridership at current travel levels would be 420 weekday inbound boardings at Milford and 235 at Holliston, for a combined total of 655. Of these, about 540 would be work trips to destinations in Boston or Cambridge, 70 would be non-work trips to Boston or Cambridge, and 45 would be trips to other destinations for all purposes. Population and employment projections indicate that ridership would increase to about 735 inbound boardings in the year 2020.

At current travel levels, a two-station extension from Framingham with express service in peak hours would serve 545 weekday inbound boardings at Milford and 310 at Holliston. Of the combined total of 855 boardings, 710 would be work trips to destinations in Boston or Cambridge, 90 would be non-work trips to Boston or Cambridge, and 55 would be trips to other destinations for all purposes. Of the latter, 20 would be interzone trips to stations on the Framingham/Worcester Line, with the

majority being destined for Framingham; the rest would be trips through Boston or Cambridge to points not served directly by Milford trains. Inbound boardings would increase to about 965 in the year 2020.

Estimated Ridership by Town of Origin

Table 4-1 shows the outer endpoints of trips in the 1996 demand estimates. Figures for individual towns for future years are not shown, because of the relatively small expected changes from 1996.

Table 4-1
1996 Estimated Weekday Inbound Ridership on Milford Extension
From Forge Park or Framingham by Town of Origin

	From Forge Park		From Framingham	
Town	All Local	Express/Local	All Local	Express/Local
Milford	265	350	270	360
Bellingham	195	205	0	0
Holliston	0	0	235	310
Hopedale	50	50	50	50
Upton	30	45	30	50
Mendon	25	30	30	30
Uxbridge	30	45	30	45
Douglas	5	10	5	10
Blackstone	50	55	0	0
Woonsocket, RI	75	95	0	0
Total	725	885	655	855

Estimated Diversions of Ridership from Other Transit Services

Currently, about 540 residents of towns that would be in the service area of a Milford extension from Forge Park use MBTA commuter rail for all trip purposes combined on weekdays. About 30 other residents of the area use MBTA rapid transit or express bus service. (Use of private carrier express buses by residents of the service area is negligible.) Current transit users would be among the most likely travelers to shift to a Milford extension. If all of them diverted, only 155 of the 725 riders with local service or 315 of the 885 extension riders with express service would be new transit users. The number of new transit users would increase only slightly, to about 180 with local service or 355 with express service by the year 2020. As discussed further below, express service terminating at Forge Park would attract some of the same new riders who would be attracted to stations on a Milford extension.

About 390 residents of towns that would be in the service area of a Milford extension from Framingham use MBTA commuter rail for all trip purposes combined on weekdays. About 60 other residents of the area use MBTA rapid transit or express bus

service. If all of them diverted, 205 of the 655 riders with local service or 405 of the 855 extension riders with express service would be new transit users. By the year 2020 the number of new transit users would increase only slightly, to about 230 with local service or 455 with express service. Some of the same new transit users may be attracted to the Framingham/Worcester Line in the near future as a result of currently planned service improvements and new stations.

Other Ridership Impacts on Franklin and Framingham/Worcester Lines

Impacts of Diversions of Parked Cars

Most of the riders who would be diverted to a Milford extension from other MBTA services access their present boarding stations by driving and parking. Diversions from stations where parking facilities are now filled to capacity on a typical weekday would allow those stations to attract new park-and-ride passengers. On an extension of the Franklin Line, 80% of the diversions would come from Forge Park Station, which currently has some unused parking capacity. Most of the other diversions would also come from stations where present unused parking capacity exceeds the number of additional spaces that would be vacated by diversions to the Milford extension. Therefore, the number of new riders attracted by freed-up spaces at existing stations would be insignificant.

On an extension from Framingham, about one third of the diversions (155 weekday inbound riders) would come from stations on the Framingham/Worcester Line where parking facilities are now filled to capacity on a typical weekday. Depending on the extent to which planned new stations between Framingham and Worcester reduce demand for parking at existing stations, some portion of the riders diverted to a Milford extension are likely to be replaced by would-be riders now turned away by lack of parking. Of the maximum potential of 155 riders attracted by vacated parking spaces, it is likely that about half, or about 80 would be new transit users.

Impacts of Milford Train Service at Existing Stations

With Milford service via Forge Park provided entirely by extending existing Franklin Line trains, frequencies or running times would not change at any existing stations, so no new ridership would be attracted to those stations on the basis of service. Milford express service via Forge Park as described above would reduce peak-period travel times to Boston from Forge Park, Franklin, Norfolk, and Walpole, and would also double the number of peak trains serving Walpole station. Service frequency would be reduced and average travel times slightly increased at stations north of Walpole. Based on travel time and headway elasticity models, at present travel levels there would be a net gain of about 240 A.M. peak riders at existing Franklin Line stations from towns outside the service area of a Milford extension. Based on survey data on the sources of riders boarding at Franklin Line stations and on use of other transit services by riders from the same towns, about half of the 240 riders, or 120, would be diverted from other transit services, and an equal number would be new transit users. Parking capacities at

some of the stations would need to be expanded if ridership were to increase as much as the potential added demand for the express service. By the year 2020, expected population changes in the Franklin Branch corridor would raise the total number of new transit users attracted to present station by the express service to about 200.

The same improvements in travel times and frequencies could be achieved with no Milford extension by running express trains from Forge Park and short-turn local trains from Walpole in peak hours. Such service would attract the same 240 additional A.M. peak riders from towns outside the service area of a Milford extension. It would also attract about 60 of the new riders who would use stations at Bellingham Junction or Milford on a Milford extension, making a total of 300. This would include about 130 riders diverted from other transit services and about 170 new transit users. By the year 2020, the number of new transit users would increase to about 250.

For purposes of analysis, it is assumed that on an extension from Framingham, Milford express trains would stop at the existing Framingham and West Natick stations. In that case, the number of Worcester express trains stopping at West Natick would probably be reduced, resulting in no change in service frequency or running time there. Framingham will already have a relatively high level of service without Milford trains. Further improvements provided by Milford express trains would be expected to attract about 60 additional inbound peak-period riders, of which about half would be new transit users.

Regardless of the peak-hour scheduling strategy, any off-peak through service from Milford to Boston via Framingham would have to be provided by new trains, since no off-peak Framingham short-turns are planned. With all off-peak service running through to Boston, the additional frequency at existing stations would attract only about 50 additional inbound riders, with boardings distributed over the entire length of the route. About 25 of these would be new transit users.

Overall population in the service area of the portion of the Worcester/Framingham Line that would be affected by Milford service is expected to change little by the year 2020. Therefore, the difference between the number of new transit riders at current travel levels and in the year 2020 would be insignificant.

Estimated Weekend Ridership

Weekend ridership is more difficult to predict than weekday ridership, because weekend travel consists largely of non-repetitive trips for purposes such as shopping, sightseeing, attending sporting events, etc. For the commuter rail system as a whole, 1994 data showed that ridership averaged 29.2% as high on Saturdays as on weekdays, and 17% as high on Sundays as on weekdays. With ratios similar to those above, stations on a Milford extension from Forge Park would be expected to serve about 210 inbound riders on Saturdays and 125 on Sundays. Stations on a Milford extension from Framingham could be expected to serve about 190 inbound riders on Saturdays and 110 on Sundays.

At the ridership levels estimated above, a Milford extension from Forge Park would be more likely to have weekend service than would an extension from Framingham. All weekend service via Forge Park could be provided by extending existing trains. Depending on the schedules of Worcester trains, all or most weekend service via Framingham would have to consist either of shuttles to Framingham or additional trains through to Boston.

Model-Based Ridership Forecast

In addition to the demand estimates produced by the methods described above and in appendix G, ridership on Milford extensions from Forge Park and from Framingham was forecast using the CTPS Interim Regional Model. This model is currently being used for all CTPS highway and transit studies within the region. The Regional Model forecasts were made for the year 2000, but were quite similar to the manual forecast results for 1996. The difference between the forecasts was not sufficiently great under any alternative to change conclusions as to the viability of an extension. Comparisons for individual alternatives are provided below and are summarized in Tables 4-2 and 4-3.

Extension from Forge Park with Local Service Only

For an extension from Forge Park operated entirely by extending existing Franklin Line train trips, the Regional model predicted that there would be 400 weekday boardings at Milford and 200 at Bellingham Junction, for a combined total of 600. The manual forecast predicted 345 boardings at Milford and 380 at Bellingham Junction, for a combined total of 725. The difference in the two forecasts was mainly in estimated diversions to Bellingham Junction from Forge Park, and in the allocations of some diverted riders between Milford and Bellingham Junction. The manual forecast indicated that of the 725 inbound extension riders, 155 would be new transit users. The Regional Model predicted 165 new inbound transit users. The latter figure would improve the ratio of incremental revenue to operating cost slightly compared with that shown in chapter 6, but would still result in performance far below the system average. These comparisons are summarized in Table 4-2.

Extension from Forge Park with Peak-Period Express Service

For an extension from Forge Park with peak-period express service, the Regional model predicted that there would be 440 weekday boardings at Milford and 250 at Bellingham Junction, for a combined total of 690. The manual forecast predicted 445 boardings at Milford and 440 at Bellingham Junction, for a combined total of 885. As was the case for the local service alternative, the difference between the two forecasts was mainly in estimated diversions to Bellingham Junction from Forge Park.

In the manual forecast, it was estimated that 315 of the boardings on the extension would be new transit riders. In addition, it was estimated that the express service would add 120 new transit users to existing Franklin Line stations. The Regional Model

predicted that the express service would attract about 490 riders at existing Franklin Line stations. A total of 315 new inbound transit riders were predicted at new and existing stations combined, with no separate figures for the two groups. These numbers indicate that boardings at extension stations alone would increase by 90 compared with local service, and that the number of new inbound transit users would increase by 150. If all of the additional boardings on the extension as the result of express service were made by new transit users, then only 60 of the additional boardings at existing stations would be by new transit users. This result implies that the majority of new express service riders at existing Franklin Line stations would be diverted from other transit services. Depending on which other services riders were diverted from, incremental revenue could be as much as 50% lower than calculated in chapter 6, resulting in a much lower revenue-to-cost ratio than indicated there. These comparisons are summarized in Table 4-2.

Table 4-2
Comparisons of Weekday Inbound
Ridership Estimates For Milford Extension from Forge Park
From Manual Method and From Regional Model

	Local Only		Peak Express/ Off-Peak Local	
	Manual	Model	Manual	Model
Milford Ons	345	400	445	440
Bellingham Ons	380	200	440	250
Total Extension Ons	725	600	885	690
New Transit Riders on Extension	155	165	315	Not calculated separately
New Transit Riders on Franklin Line	0	0	120	Not calculated separately
Total New Transit Riders	155	165	435	315

Note: Manual Forecasts are for 1996 Travel Levels. Model Forecasts are for the year 2000

Extension from Framingham with Local Service Only

For an extension from Framingham with all trains providing local service between Framingham and Boston, the Regional Model predicted that there would be 480 boardings at Milford, 120 at Braggville, and 180 at Lowland Street, for a combined total of 780. The manual forecasts, which assumed only one station in Holliston, predicted 420 boardings at Milford and 235 at Lowland Street, for a combined total of 655. The latter forecasts indicated that of the 655 extension riders, 205 would be new transit users. The Regional Model predicted 210 new transit users on the extension. The manual method also predicted that Milford trains would attract 105 new transit riders at stations on the existing Framingham/Worcester Line from Framingham east because of parking capacity freed up by diversions to the Milford extension and increased off-peak service frequency. The model forecast did not include any such riders.

The Model results were not broken down by town of origin or trip purpose, but they imply that the extension would draw riders from a somewhat larger service area than was assumed in the manual forecasts. If the higher ridership predicted by the Model resulted in a proportionate increase in revenue, the ratio of revenue to operating cost for this alternative would still not improve significantly over the very poor result discussed in chapter 6. These comparisons are summarized in Table 4-3.

Extension from Framingham with Peak-Period Express Service

For an extension from Framingham with peak-period express service, the Regional Model predicted that there would be 540 boardings at Milford, 140 at Braggville, and 220 at Lowland Street, for a combined total of 900. The manual forecast results were similar to these, predicting 545 boardings at Milford and 310 at Lowland Street, for a combined total of 855. The latter forecasts indicated that of the 855 extension riders, 405 would be new transit users. In addition, it was estimated that the express service would add 135 new transit riders to existing Framingham/Worcester Line stations as a result of added service frequency, and of parking capacity freed up by diversions to the extension.

The Regional Model predicted only 390 new transit users, including express train boardings at existing stations. This implies that most of the express riders at existing stations would be diverted from other transit services. If the lower new ridership predicted by the Model resulted in a proportionate decrease in new revenue, the ratio of revenue to operating cost for this alternative would be even worse than the very poor result discussed in chapter 6. These comparisons are summarized in Table 4-3.

Table 4-3
Comparisons of Weekday Inbound
Ridership Estimates For Milford Extension from Framingham
From Manual Method and From Regional Model

	Local Only		Peak Express/ Off-Peak Local	
	Manual	Model	Manual	Model
Milford Ons	420	480	545	540
Holliston Ons (all stations)	235	300	310	360
Total Extension Ons	655	780	855	900
New Transit Riders on Extension	205	210	405	Not calculated separately
New Transit Riders on Framingham Line	105	0	135	Not calculated separately
Total New Transit Riders	310	210	540	390

Note: Manual Forecasts are for 1996 Travel Levels. Model Forecasts are for the year 2000

5. CAPITAL COSTS

The main capital costs for commuter rail extensions consist of construction or upgrading of tracks, signals, bridges, and crossings, construction of station and parking facilities and train layover facilities, and acquisition of rolling stock. A Milford extension from Forge Park would use a rail line that is still used for freight service, but the track is in poor condition and would need to be entirely rebuilt to make it suitable for passenger service. An extension from Framingham would be partly on a line that is still used for freight service, partly on a line that was used for freight service until about 1995, and partly on a line that was dismantled almost 25 years ago. Even the track that is still in place would need to be almost entirely rebuilt to make it suitable for passenger service. Capital costs are summarized below and in Table 5-1 by category. All of the cost figures are approximations.

Track and Signals

As noted above, an extension to Milford on either alignment would require replacement of the existing track structure. Neither line is signalized, so a completely new signal system would be needed on either route. Costs for track and signals are related directly to route length; consequently the shorter extension from Forge Park would be less costly for these items.

The distance from Forge Park Station to the former Milford station site at Central Street is 6.2 miles. The cost of track reconstruction and signal installation over this distance would be $17,675,000. (This cost would be slightly lower if the station site selected was further south than Central Street.)

The distance from Framingham Station to the new Rocky Hill Station site south of I-495 is 10.5 miles. The cost of track reconstruction and signal installation over this distance would be $29,940,000.

In the past, the lines to Milford from Forge Park and from Framingham both had single track throughout, with no passing sidings. Passing sidings would not necessarily be required for future service, but would allow more flexibility in scheduling. For purposes of analysis it is assumed that an extension from Forge Park with local service only or an extension from Framingham with local or express service would include one 2,000-foot passing siding. Including trackwork, switches and interlocked signals, each such siding would cost about $3,650,000 in addition to the costs stated above. (For an extension from Forge Park, the passing siding would probably be located at some point on the existing Franklin Line rather than on the extension itself.)

For a Milford extension from Forge Park with peak-period express service, it is assumed that instead of building a passing siding, double track would be restored on about half of the present single-track segment of the Franklin Branch between Norwood Central and Franklin Junction. This would require about 6.5 miles of new track. Further analysis of scheduling strategies and construction requirements would be needed to

determine the optimal endpoints for the double-track section. To maintain schedules reliably peak-period express service from Forge Park combined with local trains from Walpole would likewise require installation of about 6.5 miles of new second track. The construction cost for track, signals, and switches alone would be about $21,710,000, or $18,060,000 more than the cost of the passing siding needed for an extension with local service only. Expenses for widening of track bridges and overpasses and relocation of station facilities now extending into the right-of-way would be in addition to this, but would be location-specific.

At present, the maximum speed limit on the Franklin Branch is 60 m.p.h. Short segments have restrictions of 50, 40, or 30 m.p.h., mostly because of curves or switches. The PMT analysis of Milford express service assumed that the maximum speed limit between Walpole and Readville would be raised to 70 m.p.h. The analysis for the present study determined that this would reduce running times to Boston from any station by at most two minutes and would not increase ridership significantly compared with service under the existing speed limits.[13] Therefore, costs for upgrading track on the Franklin Line to allow higher speeds are not included in this study.

Road Crossing Surface, Lights, and Gates

Between Forge Park Station and Central Street in Milford, the Milford Secondary Track has 7 grade crossings of public roads and at least 2 crossings of private roads. At present, all the crossings are protected only by signs. The public crossing surfaces generally consist of asphalt pavement, with timbers next to the rails. These surfaces are in fair to poor condition. For passenger service, all of the public crossings should be rebuilt with rubberized surfaces, and automatic flashing lights and gates should be installed. The cost of these improvements would be $1,440,000.

Between Framingham Station and the new Rocky Hill station site in Milford, the Holliston Secondary Track right-of-way has 15 grade crossings of public roads and at least 5 crossings of private roads. Four of the public crossings are on the active segment of the line in Framingham. These crossings have automatic flashing lights, but not gates, and crossing surfaces are in good condition. At all of the other grade crossings, automatic protection devices were either never installed or were removed long ago. Where rails are still in place, public crossing surfaces generally consist of asphalt pavement, with timbers next to the rails. For passenger service, all of the public crossings south of Framingham should be rebuilt with rubberized surfaces, and automatic flashing lights and gates should be installed. Protection at the four crossings in Framingham should be upgraded to include automatic gates. The cost of all of these improvements would be $2,945,000.

[13]Based on travel time elasticity formulas, the total ridership increase attributable to higher speed limits would be only about 40-50 inbound passengers per day.

Fencing

At present, most of the rights-of-way of the Milford and Holliston Secondary tracks are unfenced. For safety, fencing would be needed at all locations where developed land adjoins the right-of-way of whichever alignment is used. A preliminary inspection indicates that an extension from Forge Park would require about 7,000 linear feet of fencing, at a cost of about $45,000.

On an extension from Framingham to Rocky Hill, the greater total route length and greater amount of development along the right-of-way compared with a Milford extension from Forge Park would require a total of approximately 26,000 linear feet of fencing. This cost of this would be about $170,000.

Bridges

The rail line between Forge Park and downtown Milford does not cross any roads on bridges. It does, however, cross six short bridges over the upper Charles River or its tributaries. These are all old open-deck wooden bridges, in fair condition. For passenger service, all of these bridges should be replaced. The cost of this would be about $1,930,000. Three roads cross the rail line on bridges. Passenger service would not require any improvements to these bridges that would not otherwise be needed to maintain the existing freight service on the line, so no cost for upgrading these bridges has been included.

The rail line between Framingham and Rocky Hill crossed two roads on bridges. Both of these are near Holliston Center, on the segment of the line that is inactive but not officially abandoned. These bridges do not appear to require any major improvements to allow for passenger service.

The longest water crossing on the Holliston Secondary is that of Jar Brook in Holliston. This is an eight-span stone-arch bridge, built in 1847. Repairs to this bridge to allow for passenger service would cost about $90,000.

The Holliston Secondary also makes two crossings of Chicken Brook in Holliston on concrete box culverts, and one crossing of Hopping Brook on a wood and stone bridge. These are all in poor condition, and should be replaced for passenger service. This would cost about $280,000.

Two roads crossed the Holliston Secondary between Framingham and Rocky Hill on bridges. The Whitney Street bridge in Sherborn and the twin bridges of I-495 in Milford are still in place, and would not require any major improvements for passenger service.

In summary, the total cost of all bridge improvements required on an extension from Forge Park to Milford would be $1,930,000. The cost of bridge improvements on an extension from Framingham to Rocky Hill would be $370,000.

Station Platforms and Shelters

Stations on an extension to Milford from Forge Park or from Framingham would all be either at locations where there were never stations in the past or at locations where no usable components of past stations remain. Therefore, all-new construction would be needed at each site. The current standard for new MBTA commuter rail stations is eight-car high-level platforms. Although ridership at stations on either extension alignment alone would not require eight-car trains, Milford trains would also serve some stations on either the Franklin or Framingham/Worcester Lines. In addition. for scheduling efficiency it is desirable to allow equipment sets to shift between routes at South Station. For these reasons, it is assumed that Milford extension stations would have eight-car high-level platforms. Recent construction costs for such platforms for the Old Colony lines, including benches, shelters, and lighting but excluding land acquisition averaged $1,200,000 per station. This unit cost is assumed below.

A Milford extension from Forge Park would have two stations: Bellingham Junction and Milford. The cost of platforms and shelters for these stations would be $2,400,000.

A Milford extension from Framingham would also have, at minimum, one station in Milford and one in Holliston. The cost of two stations on this extension would also be $2,400,000. The 1990 Stone & Webster study concluded that there should be two stations in Holliston and one in Milford. The demand analysis in chapter 4 and appendix G of the present study indicates that with unconstrained parking at Milford there would be little demand for a second Holliston station. If it is not feasible to provide parking at a Milford station for all of the demand there, a station in the southern edge of Holliston could accommodate the overflow, however. The total cost for platforms and shelters at three stations would be $3,600,000. (The cost summary in Table 5-1 includes only two stations.)

Parking

The required parking capacity on a Milford extension would depend on the alignment used, the service operating strategy, and the general station locations. The capacities below are based on weekday ridership at present travel levels, with an allowance for day-to-day ridership variation. Projected future growth in ridership would not change parking requirements significantly.

If all service to Milford were provided by extending existing Franklin Line train trips, 200 parking spaces would be needed at Milford and 280 at Bellingham Junction, or a combined total of 480. No new spaces would be needed at existing stations.

On a Milford extension from Forge Park with peak-period express and off-peak local service, 260 parking spaces would be needed at Milford and 335 at Bellingham Junction. After taking into account diversions to extension stations and new riders attracted by express service, the demand for parking spaces at present Franklin Line stations would exceed existing and currently committed capacity by about 50 spaces. Therefore, a

combined total of 645 new spaces would be needed at extension stations and existing stations. If peak-period service on the present Franklin Line were replaced by express trains from Forge Park and local trains from Walpole with no Milford extension, about 60 parking spaces would need to be added to the number currently existing or committed.

Assuming use of surface lots only, the cost of constructing parking for the local-service Milford extension alternative would be $2,015,000. The cost of constructing parking for the alternative with peak-period express service would be $2,650,000. For Forge Park peak express service with Walpole short-turns but no Milford extension, the construction cost for the necessary additional parking would be about $180,000.

Parking expansion for any of these alternatives would require some land acquisition. The cost for this would depend on the appraised values of the specific sites used. For planning purposes, the MBTA currently assumes average land acquisition costs of $500,000 per station for new commuter parking lots or $250,000 per stations for expansion of existing lots. At these prices, land acquisition for parking would cost $1,000,000 for a Milford extension with local service only, $1,250,000 for a Milford extension with peak-period express service, or $250,000 for Forge Park express service without a Milford extension.

On an extension from Framingham terminating at Rocky Hill with all service provided by extending Framingham local train trips, 320 parking spaces would be required at Rocky Hill and 105 at Holliston, or a total of 425 spaces. With peak-period express and off-peak local service and two stations, a total of 575 parking spaces would be needed. Of these, 150 would be at Holliston and 425 at Rocky Hill. The cost of constructing 425 spaces would be $1,785,000. The cost of 575 spaces would be $2,415,000. Shifting some parking capacity from Rocky Hill to a second Holliston station would not change the total costs of parking space construction significantly from those above.

With the same average prices discussed above, land acquisition for parking on a two-station Milford extension from Framingham would cost about $1,000,000 for either terminal location or either service alternative. With three stations, this would increase to $1,500,000.

Layover Facility

As discussed in chapter 3, the extension should include a layover facility to minimize operation of non-revenue train-miles. The cost of a facility of the size needed for a Milford extension would be about $2,270,000 regardless of which alignment was used.

Rolling Stock

Rolling stock costs attributable to a Milford extension would include acquisition of locomotives and coaches that would be needed to operate the commuter rail system

with the extension but would not be needed without it. Locomotives now cost about $2,000,000 each and double-deck coaches about $1,800,000 each.

Compared with present Franklin Line service, an extension from Forge Park with local service at all times would require no additional locomotives, and only one additional coach, at a cost of $1,800,000. An extension from Forge Park with peak-period express service from Milford and local trains from Walpole would require assignment of three more train sets to the Franklin Line during peak periods than would be needed to maintain the present service configuration. To allow interchangeability of train sets among assignments, present policy is to include at least six coaches per set. This would require 18 coaches for three trains, but three of these could be provided by reducing three of the sets now used on the line from seven to six cars each. Therefore, the total new equipment requirement would be 15 coaches and three locomotives. The acquisition cost for these would be $33 million. Without a Milford extension, replacing existing peak-period service with express trains from Forge Park and local short-turns from Walpole would also require three additional train sets, which would likewise cost $33 million. Compared with this as a base case, a Milford extension with peak-period express service would involve no extra rolling stock cost.

Service on the Framingham/Worcester Line has been changing gradually as the number of trains running through to Worcester increases. For purposes of analysis, it was assumed that a Milford extension from Framingham would not be built until after the full implementation of Worcester service. The base-case would then consist of a mix of express and local trains originating at Worcester with some Framingham local short turns during peak hours. Compared with this, operation of a Milford extension with local service at all times would require two additional train sets. With a minimum train length requirement of six cars for reasons discussed above, 12 coaches would be needed for these sets, but four of these could be obtained by reducing four present train sets from seven to six cars each. Therefore, the total new equipment requirement would be eight coaches and two locomotives. The acquisition cost for these would be $18.4 million.

A Milford extension with peak-period express service would require assignment of four more train sets to the Framingham/Worcester Line than would otherwise be needed. The net equipment acquisition requirement would be four locomotives and 20 coaches, at a cost of $44,000,000.

The reasons for the equipment requirements for these alternatives are discussed in further detail in Appendix C.

Summary of Capital Costs

The capital costs discussed above are summarized in Table 5-1. Estimated capital costs for a Milford extension from Forge Park with local service only would total $41,975,000. With peak-period express service and off-peak local service, additional costs for parking and rolling stock and second-track extension required by more frequent service and

higher demand would increase capital costs to $98,535,000. These figures do not include costs for purchasing the right-of-way and track structure of the Milford Secondary Track, which is currently owned by Conrail but leased to the MBTA.

Capital cost requirements for Forge Park peak express service with Walpole short-turns but no Milford extension would include additional rolling stock, additional parking capacity at existing stations, and restoration of double track on part of the single-track segment of the Franklin Branch between Norwood Central and Franklin Junction. Including allowances for contingencies, engineering, administration, and inspection, these improvements would cost at least $65,260,000.[14]

For a two-station extension from Framingham to the new Rocky Hill site in Milford, capital costs would total $74,615,000 with local service only, or $102,535,000 with peak-period express service and off-peak local service. These figures do not include costs for purchasing the right-of-way and track structure of the Holliston Secondary Track, which is currently owned by Conrail, nor the cost of acquiring right-of-way segments south of Metcalfs now owned by various parties.

Capital Costs Relative to New Transit Ridership

Capital cost per new transit rider is one measure commonly used in evaluating proposed transit projects. Estimates of total ridership and new transit ridership for the various Milford extension alternatives are discussed in chapter 4. Capital costs per new transit rider for these alternatives are shown in Table 5-1, and discussed below. These costs are expressed in terms of new inbound riders, because most individuals using MBTA commuter rail make one inbound trip and one outbound trip each day that they use the system. The ridership figures used are projections for the year 2020, for consistency with other extension studies. Ratios for earlier years would be higher. In the 1994 PMT, the number of new transit trips shown for each project was the combined total of new riders in both directions. For comparison with the ratios in Table 5-1, the PMT costs per new rider must be doubled.

For an extension from Forge Park, the capital cost per new inbound transit rider would be $233,194 with local service only or $177,541 with express and local service. By the year 2020, nearly half of the new ridership for the Milford extension would consist of express train passengers boarding at stations on the present Franklin Line. The capital cost per new transit rider for Forge Park express service without a Milford extension would be $261,040. When compared with a base-case of express service terminating at Forge Park, the capital cost per additional transit trip for the Milford extension with express service decreases to about $109,000. Given the high cost per new transit user of the Forge Park express alternative, however, future service without a Milford extension is likely to be more similar to present service. As discussed in chapter 6, express service

[14]Upgrading of the present Franklin Line to raise the maximum speed limit from 60 m.p.h. to 80 m.p.h. would require additional expense not calculated in this study. Such upgrading would have an insignificant impact on estimated ridership.

to either Forge Park or Milford would have a revenue-to-operating cost ratio far below the present system average, as would any of the other Milford alternatives.

For an extension from Framingham to Rocky Hill, the capital cost per new inbound transit rider would be $222,731 with local service only, or $173,788 with express and local service. Operating off-peak service with shuttle trains from Milford to Framingham would not change capital costs compared with through trains to Boston, because fixed facility and rolling stock requirements would both be determined by peak-period requirements. Shuttle service would, however increase capital costs per new transit trip slightly because fewer new transit riders would be attracted in off-peak hours.

In terms of capital cost per new transit rider in the year 2020, all of the Milford extension alternatives discussed above would be among the least cost-effective commuter rail extensions examined in the PMT. For comparison, the most recent estimate of the same measure for the Worcester extension is $45,732. For the Newburyport extension, the figure is $93,055. Both of these projects are currently under construction.

Table 5-1
Summary of Capital Costs for Milford Extension Alternatives and Forge Park Express Service Alternative

Item	Milford (Central St.) Extension from Forge Park: All Local	Milford (Central St.) Extension from Forge Park: With Peak Express	No Extension Forge Park Express and Walpole Local Trains	Milford (Rocky Hill) Extension From Framingham: All Local	Milford (Rocky Hill) Extension From Framingham: With Peak Express
Fixed Facilities					
Track, Signals, and Passing Sidings	$21,325,000	$39,385,000	$21,710,000	$33,590,000	$33,590,000
Grade Crossing Surface, Lights, Gates	1,440,000	1,440,000		2,945,000	2,945,000
Fencing	45,000	45,000		170,000	170,000
Bridges	1,930,000	1,930,000		370,000	370,000
Station Platforms and Shelters	2,400,000	2,400,000		2,400,000	2,400,000
Parking (including land acquisition)	3,015,000	3,900,000	430,000	2,785,000	3,415,000
Layover Facility	2,270,000	2,270,000	2,270,000	2,270,000	2,270,000
Contingencies	3,145,000	5,015,000	2,415,000	4,355,000	4,420,000
Engineering, Administration & Inspection	4,495,000	7,170,000	3,455,000	6,225,000	6,315,000
Subtotal	$40,065,000	$63,555,000	$30,280,000	$55,110,000	$55,895,000
Rolling Stock					
Locomotives and Coaches	$1,800,000	$33,000,000	$33,000,000	$18,400,000	$44,000,000
6% rolling stock Eng., Admin. & Inspection	110,000	1,980,000	1,980,000	1,105,000	2,640,000
Subtotal Rolling Stock	$1,910,000	$34,980,000	$34,980,000	$19,505,000	$46,640,000
Total Capital Cost	$41,975,000	$98,535,000	$65,260,000	$74,615,000	$102,535,000
Capital Cost Per New Transit Rider (year 2020)	$233,194	$177,541	$261,040	$222,731	$173,788

Notes: Costs for second track on Franklin Line for Milford or Forge Park express service do not include widening of bridges or grade crossings or relocation of station facilities on right-of-way.
Costs for extensions from Framingham assume two stations. With a third station, costs would increase by $1,490,000 including allowances for contingencies, engineering, administration, and inspection
All costs are approximate; detailed engineering studies would be needed to refine costs.

Operating Costs

Operating costs for a Milford extension would depend on the alignment selected and on the number of trips operated each day. In addition, costs would depend on the proportion of service provided by entirely new trips versus that provided by lengthening trips that would operate over part of the route anyway. For each of the extension alignments, operating costs were calculated for several alternatives, as discussed below. These costs and corresponding revenues are shown in Table 6-1.

Extension from Forge Park

For an extension from Forge Park, the least costly alternatives would provide all service to Milford by extending trains that would otherwise terminate at Forge Park or Franklin. With all such trains extended on weekdays and weekends, annual operating cost would increase by $1,950,000 compared with present Franklin Line service.[15] Providing service to Milford only on weekdays and Saturdays would reduce the incremental cost to $1,745,000. With service only on weekdays, the incremental cost would be $1,500,000.

In the other group of alternatives examined for an extension from Forge Park, Milford would be served during weekday peak hours with trains running non-stop from Walpole Station to downtown Boston. Additional trains originating at Walpole would serve all stations omitted by the express trains. Except during weekday peak hours, all service to Milford would be provided by extending trains that would otherwise terminate at Forge Park or Franklin. The annual incremental cost of this strategy, including weekday and weekend service, would be $4,130,000.[16] This would be $2,180,000 more than the cost of providing all Milford service with extensions of existing trains, or more than twice the cost. Since the express service would be operated only on weekdays, the same differential would apply in comparisons of service omitting Sundays or omitting both Sundays and Saturdays.

With no Milford extension, replacing present Franklin Line peak-period service with express trains terminating at Forge Park and local trains terminating at Walpole would increase operating costs by $1,580,000.[17] Compared with this as a base case, the

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[15]This cost includes an assumption that five trainsets would be based at a new layover facility in Bellingham and one set in Boston. At present, three sets are based at a facility near Franklin Station and three at Boston.

[16]This cost assumes that the Milford express and local service would use five train sets based at a new layover facility in Bellingham and one set based in Boston. The Walpole local service would use three train sets based at the present Franklin layover facility.

[17]This cost assumes that the Forge Park express and local service would use five train sets based at a new layover facility in Bellingham and one set based in Boston. The Walpole local service would use three train sets based at the present Franklin layover facility.

additional operating cost for a Milford extension with express service would be $2,550,000.

Extension from Framingham

Each of the operating alternatives analyzed for an extension from Framingham would be more costly than the local-service alternative for a Forge Park extension served on the same number of days per week. Most of the Framingham extension alternatives would also be more costly than a Forge Park extension with weekday peak-period express trains. Because of the problems associated with restoring the right-of-way all the way through to Central Street in Milford (discussed in appendix E) the operating costs in this chapter assume a terminal at the new Rocky Hill site south of I-495.

The operating strategies examined for an extension from Framingham included having Milford trains serve all stations from Framingham to Boston at all times or having peak-period Milford trains run non-stop between West Natick and Boston. The base-case used for comparison was the anticipated schedule on the Framingham/Worcester line after full implementation of service to Worcester. Under this schedule, Framingham short-turns would be operated only during weekday A.M. peak hours. For purposes of cost calculation, it was assumed that in the extension options without express service, the Framingham trains would be extended to Milford. It was further assumed that three P.M. peak Worcester local trains that would leave Boston shortly after Worcester express trains would be replaced by Milford local trains.

Costs were also calculated for strategies under which weekday peak Milford trains would operate through to Boston but off-peak and weekend trains would operate as shuttles between Milford and Framingham Station. Close connections with Worcester trains would be scheduled at Framingham.[18]

The least costly alternative for an extension from Framingham would have peak-period trains running through to Boston in local service, with all off-peak service provided by shuttles between Rocky Hill and Framingham. With weekday and weekend service, the incremental cost of this option would be $3,210,000 per year. This would be 65% more than the cost of a Forge Park extension with local service only, but 22% less than the cost of a Forge park extension with express service. The incremental cost for a Rocky Hill extension with off-peak Framingham shuttles would be reduced to $2,885,000 if there were no Sunday service and to $2,480,000 if there were no Saturday or Sunday service.

The operating cost of an extension from Framingham to Rocky Hill with local service through to Boston at all times would be $7,190,000. This would be 1.7 times as costly as a Forge Park extension with peak-period express service and 3.7 times as costly as providing all service with extensions of present Franklin Line trains. The most costly of the Framingham extension options examined would be that with weekday and

[18]Service involving such transfers was once widespread in the Boston commuter rail system. Some late-night service on the Rockport/Ipswich Line is still provided in this manner.

weekend service, all trains running through to Boston, and weekday peak-period express service. The incremental annual cost of this option would be $9,160,000.

Operating Revenues

Operating revenues were estimated for Milford extensions from Forge Park and from Framingham. Revenue calculations were based on the present fare structure. Ratios of Saturday and Sunday ridership and revenue to weekday totals were assumed to be similar to those for present MBTA commuter rail lines. In the discussion below, all revenue figures are based on ridership at current travel levels. Expected increases in ridership by the year 2020 would not improve the revenue-to-cost ratios of any of the alternatives significantly.

Extension from Forge Park

For a Milford extension from Forge Park served entirely by extending existing Franklin Line trains, annual fare revenue from passengers using extension stations would be $1,250,000. Riders who would be diverted to the extension from existing MBTA commuter rail, rapid transit, and express bus services currently account for annual fare revenue of $895,000 on those services. Therefore, taking into account only boardings on the extension, annual fare revenue for the MBTA system would increase by $355,000. This alternative would not attract significant numbers of new riders to existing stations. Operation of Milford service only on weekdays would reduce the annual revenue increase to $315,000.

For a Milford extension from Forge Park with peak-period express service, annual fare revenue from passengers using extension stations would be $1,545,000. Like the local service alternative, this would include diversions of passengers accounting for $895,000 of revenue on other MBTA services. Therefore, including only boardings on the extension itself, annual fare revenue for the MBTA system would increase by $650,000.

As discussed in chapter 4, most of the riders diverted from other services would come from stations where present parking capacity exceeds demand, so most of the freed-up spaces would not immediately be re-filled. For this reason, no revenue from new riders attracted only because of freed-up parking capacity has been included in the calculations for this alignment. Operation of Milford express trains would, however, attract about 240 additional A.M. peak riders to existing stations, provided that there was adequate parking capacity for those needing auto access. Fare revenue from these passengers would total about $330,000. Diversions from other commuter rail lines would reduce revenue on those lines by about $125,000, so the net gain for the system as a whole would be $205,000. Adding this to the new revenue at extension stations results in total new revenue of $855,000 for the extended Franklin Line.

Operation of Milford express and local service on weekdays with no weekend service would reduce the annual revenue increase to $780,000. If Forge Park express service were implemented without a Milford extension, some of the new transit users who

would be attracted to stations on an extension would instead be attracted to one of the existing stations. This would result in new revenue of approximately $285,000 from 300 additional riders if the express trains were supplemented by local trains terminating at Walpole. Compared with this as the base case, new revenue from the Milford extension would be $570,000.

Extension from Framingham

For a Milford extension from Framingham with all trains running through to Boston in local service, annual fare revenue from passengers using extension stations would be $1,090,000. Ridership would include diversions of passengers who currently account for $640,000 of revenue on other MBTA services. Therefore, including only boardings on the extension itself, annual fare revenue for the MBTA system would increase by $450,000. About one third of the diversions would come from stations on the Framingham/Worcester Line where parking facilities are now filled to capacity on a typical weekday. If all of the parking spaces freed up by these diversions were refilled, this would add about $120,000 in new system revenue. This alternative would not change peak-period service frequency or running times at any existing stations, so no new peak-period riders would be attracted other than those using freed-up parking. With off-peak service running through to Boston, the additional frequency at existing stations would generate another $35,000 per year in new weekday revenue and $80,000 in new weekend revenue.

Including all ridership changes discussed above, a Milford extension with local service through to Boston at all times would increase MBTA system revenue by $685,000 per year. Operation of Milford service only on weekdays would reduce the annual revenue increase to $555,000.

Off-peak ridership at stations on a Milford extension was not estimated specifically for service requiring a transfer at Framingham Station, but this would be expected to reduce demand somewhat compared with through service to Boston. Under the transfer service alternatives, off-peak train frequency at existing stations would be the same with or without a Milford extension, so ridership at those stations would be unchanged. Therefore, the transfer alternatives would not attract the $35,000 in off-peak weekday or $80,000 in weekend revenue attributable to increased off-peak frequency alone. This would reduce new revenue from the extension with through local service in peak hours to at most $570,000 per year.

For a Milford extension from Framingham with peak-period express service and all service running through to Boston, annual fare revenue from passengers using extension stations would be $1,435,000. Of this, $795,000 would represent new MBTA system revenue. As under the local service option, if all of the parking spaces at existing Framingham/Worcester Line stations freed up by diversions to the extension were refilled by new system riders, this would add another $120,000 in revenue.

The added frequency provided by Milford express trains at Framingham Station would attract about 60 additional inbound peak-period riders there, with annual new revenue of $50,000. With off-peak service running through to Boston, the impact on service at existing stations would be the same as that under the alternative with peak-period local service, resulting in additional annual revenue of $115,000. Including all ridership changes discussed above, a Milford extension with peak-period express service and through trains to Boston at all times would increase MBTA system revenue by $1,080,000 per year. Operation of Milford service only on weekdays would reduce the annual revenue increase to $910,000.

Comparisons of Revenues and Operating Costs

Using calculation methods comparable to those used in this study for all Milford extension alternatives, the revenue-to-operating cost ratio for the MBTA commuter rail system as a whole in 1996 was about 42%. All of the Milford alternatives would have ratios much lower than this. Results for individual alternatives are discussed below.

Table 6-1 summarizes the operating costs and revenues of the two alternatives examined for a Milford extension from Forge Park and of three alternatives for an extension from Framingham. None of the other Milford alternatives examined for this study would have significantly better results than those shown.

Extension from Forge Park

For service provided by extending all Franklin Line trains that now terminate at Forge Park or Franklin Station to Milford, new revenue after accounting for diversions from existing services would equal 18% of incremental operating costs. This would be less than half the average on existing MBTA commuter rail lines. Operation of Milford service only on weekdays would improve the revenue-to-cost ratio for all-local service to 21%.

For an extension to Milford from Forge Park including weekday peak-period express service with local service during weekday off-peak hours and on weekends, maximum new revenue would equal 21% of incremental operating costs. This would be half the fare-recovery ratio on existing MBTA commuter rail lines. Eliminating weekend service would result in a negligible increase in this ratio.

With no Milford extension but present Franklin Line peak-period service replaced with express trains terminating at Forge Park and local trains terminating at Walpole, new revenue would equal only 18% of added operating cost. In this measure, this option would rank about the same as a Milford extension with all-local service, but slightly lower than a Milford extension with off-peak local and peak express service.

Extension from Framingham

For an extension from Framingham to Milford (Rocky Hill) with local service through to Boston at all times, new system revenue would cover only about 10% of incremental operating cost. This would equal less than one quarter of the systemwide average revenue-to-cost ratio.

For an extension to Rocky Hill with peak-period express service and all service running through to Boston, maximum new revenue, including net changes at existing stations, would equal 12% of incremental operating costs. Incremental revenue would be about 26% greater than that of an extension from Forge Park with peak-period express service, but incremental operating cost for an extension from Framingham would be 122% higher.

Provision of off-peak and weekend Milford service with shuttle trains from Framingham rather than with through trains from Boston would reduce operating cost significantly with only slight impact on revenue. A service including peak-period express trains to Boston and off-peak shuttles would have a revenue-to-cost ratio of about 20% . These ratios would still be only about half the systemwide average however. With peak-period local trains through to Boston and off-peak shuttles, the revenue-to-cost ratio would be only about 17%.

The highest revenue-to-cost ratio for any Framingham extension option examined would be achieved with peak-period express service from Rocky Hill to Boston, off-peak shuttle service to Framingham, and no weekend service. The ratio for this alternative would be 22%.

Table 6-1
Cost and Revenue Comparisons
for Milford Extension Alternatives
and Forge Park Express Service Alternative

Item	Milford (Central St.) Extension from Forge Park: All Local	Milford (Central St.) Extension from Forge Park: With Peak Express	No Extension Forge Park Express and Walpole Local Trains	Milford (Rocky Hill) Extension From Framingham: All Local	Milford (Rocky Hill) Extension From Framingham: With Peak Express
Annual Operating Cost	$1,950,000	$4,130,000	$1,580,000	$7,190,000	$9,160,000
Incremental Fare Revenue	$355,000	$855,000	$285,000	$685,000	$1,080,000
Incremental Revenue/ Operating Cost	0.182	0.207	0.180	0.095	0.118
New Transit Riders (1996 travel levels)	155	435	170	310	540

Impact of Milford Extension on Other Commuter Rail Services

Impacts of Forge Park Extension on Route South of Readville

Trains running between Boston and Forge Park operate over the Franklin Branch between Readville and Franklin Junction (0.5 miles south of Franklin Station) and over the Milford Secondary Track between Franklin Junction and Forge Park.[19] At present, the Franklin Branch is mostly single tracked. There is a 5-mile segment of double track between Sprague Street, one third of a mile south of Readville, and Norwood Central Station. There is also a 2,150 foot passing siding just south of Walpole Station.

Under any of the operating alternatives considered for a Milford extension, it would be necessary to revise the present schedules of some trains north of Forge Park. Any changes in the number of trains operating on the Franklin Line, or in the departure times of existing trains, would have to take into consideration the locations at which inbound and outbound trains would pass. In addition, if trains did not all stop at the same stations, departure intervals would have to be arranged to prevent faster trains from overtaking slower ones traveling in the same direction.

At one time, the Franklin Branch was entirely double tracked, but the Milford Secondary was always entirely single tracked. Potential scheduling problems could be reduced by reinstalling the second track on the existing grade on all or part of the route between Norwood Central and Franklin Junction. The capital cost estimates in chapter 5 for a Milford extension served entirely by extending present Franklin Line trains assume that a 2,000-foot passing track would be added at some point in the single-track section. The cost estimates for service including peak-period express trains include an allowance for restoration of double track on about half of the line between Norwood Central and Franklin Junction. Scheduling constraints imposed by the present track layout are discussed in greater detail in appendix D.

Impacts of Forge Park Extension on Route North of Readville

Between Readville Station and South Station most Franklin Line trains run via former Boston & Providence Railroad Main Line, now known as the Amtrak New Haven to Boston or NHB Main Line.[20] This route segment has three tracks, which Franklin Line trains currently share with commuter trains originating at Stoughton, Attleboro, South Attleboro, and Providence, Rhode Island, and with Amtrak intercity passenger trains

[19]For dispatching purposes, the entire rail line from Readville to Milford via Franklin is currently designated as the Franklin Branch. The older Milford Secondary designation is used in this study to distinguish the portion of the Franklin Branch between Franklin Junction and Milford from that between Readville and Franklin Junction.

[20]In the May 1997 schedule, 14 of 19 Franklin Line inbound trains and 16 of 19 outbound trains used this routing.

from New York City and points south. Between Forest Hills and South Station, the same tracks are also used by Needham Line commuter trains.

Schedules of Franklin Line trains must be coordinated with those of all of the others on the segment north of Readville. A Milford extension would affect the times at which some Franklin Line trains would need to use shared tracks. Under the express service alternatives, there would also be increases in the total number of Franklin Line trains during peak periods. As discussed further in appendix D, present overall use of the tracks between Readville and South Station during peak hours is less than their combined theoretical capacity, but the available time slots would not all be optimal for the requirements of a Franklin Line with Milford service or with Forge Park express service Furthermore, some of the slots now available will be required for planned expansion of service on other commuter rail routes, and the addition of high-speed intercity service.

The feasibility of adding Milford trains or Forge Park express trains to the NHB Main Line would need to be determined by a more detailed analysis than was possible for this study. If capacity of that line was found to be insufficient, it would be possible to route some commuter trains from any of the routes except the Needham Line via the Dorchester Branch (Fairmount Line) between Readville and South Station.

Impacts of Framingham Extension on Framingham/Worcester Line

A Milford extension from Framingham would use the tracks of the Framingham/ Worcester commuter rail line between Framingham and Boston. This line is mostly double-tracked, but a 1.6-mile single-track section adjoining the Conrail Beacon Park freight yard in Allston puts some constraint on schedules. On the double-track segments, signaling on both tracks allows trains to operate in either direction on either track. Crossovers about halfway between Framingham and South Station allow trains in either direction to change tracks. There appears to be sufficient capacity for Milford trains in addition to planned Framingham and Worcester trains and limited intercity service, but this would need to be verified by a more detailed analysis than was possible for this study. Further details on capacity constraints on this line are discussed in appendix D.

Impacts on Intercity Passenger Service

Impacts of an Extension from Forge Park

The Franklin Line once carried intercity passenger trains between Boston and points in southern New England and New York. The last such service ended more than 40 years ago, however. Because of track abandonments south of Franklin, future intercity passenger service on this route is very unlikely.

The New Haven - Boston (NHB) Main Line, which links the Franklin Branch with South Station, is part of Amtrak's Northeast Corridor which runs between Boston, New York,

and Washington, D.C. As of May 1997, the Amtrak schedule included nine Boston arrivals and nine departures via this route on weekdays. One arrival and two departures were scheduled during the A.M. peak, and the same number during the P.M. peak.[21] Because of the long trip distances, actual arrival times of the intercity trains are much more variable than those of the commuter trains.

Amtrak is now electrifying the segment of the Northeast Corridor between New Haven and Boston. (The segment between New Haven and Washington is already electrified.) Following completion of the electrification in 1999, Amtrak plans to institute high-speed service with hourly Boston arrivals and departures. Some of the existing intercity service will also be retained. The result will be a substantial increase in the number of intercity trains with which operation of Franklin Line and other commuter trains on the NHB Main Line will need to be coordinated. In addition to the number of trains, different speed limits will be an issue. Present MBTA policy restricts the maximum speeds of commuter trains to 80 m.p.h., but the speed limit for intercity trains for most of the distance between Back Bay and Readville is 100 m.p.h. This limit may be raised further when the high-speed service is implemented.

At present, Amtrak does not schedule any trains to run via the Dorchester Branch, but it is available as an emergency detour route. In the future, Amtrak will be able to use this route only if it is electrified along with the Northeast Corridor. In any case, it is unlikely to carry enough intercity trains to cause scheduling problems there.

Impacts of an Extension from Framingham

Amtrak currently operates two intercity trains each way per day on the Framingham/Worcester Line. One round trip goes to New York and Washington, D.C., and the other to Chicago via Albany. The Washington trains were shifted from the NHB Main Line in November 1996. Future levels of New York/Washington service on this route will likely depend on the success of these trains. In the past, Amtrak has never operated more than two such round trips per day this way. The Chicago trains have been operating since 1975. Amtrak had planned to discontinue them in November 1996 because of a funding shortage. They were continued until May 1997 under a special congressional appropriation, and are being been continued beyond that under an agreement with the Massachusetts Executive Office of Transportation and Construction. It is likely that at least the present level of intercity service will be operating on this line in future years.

As of May 1997 the outbound New York/Washington train was scheduled to leave Boston at 7:55 a.m., but in the past there have been frequent changes in departure times for such service. None of the other three intercity trains on the Framingham/Worcester Line run during A.M. peak hours. The inbound Chicago train is scheduled to arrive in Boston at 4:01 P.M., but it is often late. Depending on when it actually enters commuter

[21] As of July 1997, the train scheduled to arrive at South Station at 7:49 a.m. was replaced by a train with a scheduled 6:00 a.m. arrival.

territory, it can either delay or be delayed by commuter trains. Under the present schedule, six outbound commuter trains and two inbounds use the tracks between Framingham and Boston during P.M. peak hours. When full service to Worcester is implemented, P.M. peak track use is likely to increase by at least one train in each direction. Milford service would result in a net increase of two to four outbound trains and at least one inbound during the P.M. peak compared with full Worcester service. If the Chicago train remains on its present schedule, potential conflicts with commuter trains will increase even without a Milford extension but the increase in conflicts would be much greater with an extension.

Impacts on Freight Service

The Franklin Branch south of Walpole and the Milford Secondary Track have local freight service but not through freight service. These lines are usually served by one or two freight trains per day in each direction, run in the midday.

The segment of the Franklin Branch between Walpole and Readville is used by up to three local freight trains and one through freight train per day in each direction, with a fourth local train running as far as Norwood Central. Most of these are run during off-peak hours. A Milford commuter rail extension from Forge Park would increase the number of trains on the Franklin Line mostly during peak hours, so there would be limited impact on freight operations. At Walpole Station the Franklin Line crosses the Conrail freight line between Mansfield and Framingham at grade. This creates a potential for delays of trains on either or both lines, but few freight trains currently pass over the crossing each day.

The Milford Secondary currently has no passenger service between Forge Park and Milford; the extension could require some adjustment in freight switching operations there.

The segment of the NHB Main Line between Readville and Back Bay is now used exclusively by passenger trains. This segment of the line is in a cut below street level, with no possibility of future on-line freight use. Conrail freight trains moving between the Beacon Park yard on the Framingham /Worcester Line and the *Boston Herald* printing plant or points in South Boston must cross the NHB Main Line at grade between Back Bay and South Station. Such operation is already restricted to late-night hours because of the heavy volume of passenger trains on this line, so the addition of Milford trains or Forge Park express trains would have little or no impact on the freight service. Freight service on the Dorchester Branch consists of at most one local freight train per day in each direction.

The Holliston Secondary Track is mostly out of service, but Conrail delivers auto rack cars to an unloading facility on this line about two miles from Framingham Station. Passenger service on the Holliston Secondary could conflict with the switching operations at the auto yard, but it should be possible to arrange schedules to minimize problems.

The Framingham/Worcester commuter rail line uses the east end of Conrail's Boston Line, which is the most heavily used rail freight route in New England. As of January 1997, the segment between Framingham and Beacon Park yard in Allston was used by 4 to 6 through freights eastbound and 3 to 5 westbound on a typical weekday. Freight traffic is likely to increase after completion of planned clearance improvements to allow for double-stack container trains.

At present, all of the westbound freights are scheduled to depart Beacon Park between 8:00 P.M. and 5:00 A.M., resulting in few conflicts with passenger train schedules. Two of the eastbound trains are scheduled to arrive in Boston during the A.M. peak, however. Four others are due in Boston in mid-afternoon, but may actually arrive during P.M. peak hours. (These trains originate as far west as Saint Louis, Missouri, so they have high potential for late arrivals.) There is also some local freight service between Framingham and Natick, also usually run in off-peak hours. Adding Milford trains to the line between Framingham and Boston would reduce the amount of available track time for freight trains, especially in the afternoon.

Impacts at South Station

Milford trains running via either Forge Park or Framingham would have South Station as the Boston terminal. The ability of South Station to handle either additional trains or trains at times other than those currently scheduled must be taken into consideration. Milford service provided entirely by extending Franklin Line trains that would be running anyway would not change the total number of trips operated, but would change the Boston arrival or departure times of some trains. Schedules including express service from either Milford or Forge Park via the Franklin Line with local trains from Walpole would add three inbound trains at South Station in the A.M. peak and four outbound trains and one inbound in the P.M. peak. Local Milford service via Framingham would add no trains in the A.M. peak but would add two departures in the P.M. peak. Milford service including express trains via Framingham would add four inbound trips in the A.M. peak and four outbound trips in the P.M. peak.

As discussed in appendix D, it appears that South Station could accommodate a greater number of trains than it does at present even after the addition of Old Colony Lines service, but a more detailed analysis would be needed to determine how well the available time slots match the needed arrival and departure times of new trains. Some of the present excess capacity will be used by the new high speed intercity service, and by the planned Fall River/New Bedford extensions.

Impacts on Air Quality

Air quality impacts of transit projects are typically calculated on the basis of expected changes in vehicle miles of travel (VMT) resulting from the project. For the Boston region, the automobile-generated pollutants of greatest concern are carbon monoxide (CO), nitrous oxides (NOx), and volatile organic compounds (VOC). At present travel levels, an extension from Forge Park with peak-period express service would produce the largest reduction in VMT of all the options examined, at about 30,115 per weekday. Of this reduction, 21,665 VMT would be attributable to boardings on the extension itself, and 8,450 to boardings of express trains at stations on the present Franklin Line. Running peak-period express trains originating at Forge Park and local trains originating at Walpole with no Milford extension would result in a VMT reduction of 10,720 per weekday.

Milford service provided entirely by extending existing Franklin Line trains would produce the smallest VMT reduction of the options examined, at about 13,860 per weekday. This would be entirely attributable to boardings at extension stations.

The VMT reductions for all of the Framingham extension options examined would be between those of the two Forge Park extension options. The maximum reduction for a Framingham extension would be that with peak-period express service and off-peak through service to Boston. For this option, the reduction would be about 27,425 VMT per weekday, of which 22,475 would be attributable to boardings on the extension itself and 4,950 to new boardings on the existing Framingham/Worcester Line. The latter would result from freed-up parking capacity and additional service frequency.

With local service through to Boston at all times, the reduction would be about 18,430 VMT per weekday, of which 14,545 would be attributable to boardings on the extension itself and 3,885 to new boardings on the existing Framingham/Worcester Line. The smallest VMT reduction of any of the Framingham extension options would be that with local service through to Boston in peak hours, off-peak shuttle service to Framingham, and a terminal at Rocky Hill. The reduction for this option would be about 17,000 VMT per weekday.

The improvements in air quality associated with VMT reductions for the two Forge Park extension options and three of the Framingham options would be as shown in Table 8-1. At the same time, however, the diesel locomotives used on trains would add emissions to the air. In addition to CO, NOx, and VOC, particulate matter (PM) is of concern for diesel vehicles. For the same five options, locomotive emission increases would be as shown in Table 8-2. The net impact of the reduction in auto emissions and increase in locomotive emissions would be as shown in Table 8-3. All of the alternatives analyzed would result in overall reductions in CO levels and VOC levels but increases in NOx and particulate matter levels. The latter increases would be greatest for options requiring the largest increases in train-miles.

Table 8-1
Milford Extension and Forge Park Express Alternatives
Reduction in Average Weekday Auto Emissions

	Milford (Central St.) Extension from Forge Park		No Extension Forge Park Express/Walpole Local Trains	Milford (Rocky Hill) Extension From Framingham	
Item	All Local	With Peak Express		All Local	With Peak Express
VMT Reduction	13,860	30,115	10,720	18,430	27,425
CO Reduction	139.1 kg	302.1 kg	107.5 kg	184.9 kg	275.2 kg
NOx Reduction	23.5 kg	51.0 kg	18.2 kg	31.2 kg	46.5 kg
VOC Reduction	13.0 kg	28.2 kg	10.0 kg	17.2 kg	25.7 kg

Table 8-2
Milford Extension and Forge Park Express Alternatives
Increase in Average Weekday Train Emissions

	Milford (Central St.) Extension from Forge Park		No Extension Forge Park Express/Walpole Local Trains	Milford (Rocky Hill) Extension From Framingham	
Item	All Local	With Peak Express		All Local	With Peak Express
CO Increase	6.3 kg	20.1 kg	11.2 kg	23.2 kg	33.8 kg
NOx Increase	71.8 kg	202.4 kg	101.9 kg	251.1 kg	358.5 kg
VOC Increase	2.2 kg	7.2 kg	4.1 kg	8.2 kg	12.0 kg
PM Increase	1.0 kg	2.5 kg	1.2 kg	3.3 kg	4.6 kg

Table 8-3
Milford Extension and Forge Park Express Alternatives
Net Change in Average Weekday Emissions

	Milford (Central St.) Extension from Forge Park		No Extension Forge Park Express/Walpole Local Trains	Milford (Rocky Hill) Extension From Framingham	
Item	All Local	With Peak Express		All Local	With Peak Express
CO change	-132.7 kg	-282.1 kg	-96.3 kg	-161.7 kg	-241.4 kg
NOx change	+48.3 kg	+151.3 kg	+83.7 kg	+219.9 kg	+312.0 kg
VOC change	-10.8 kg	-21.0 kg	-5.9 kg	-9.1 kg	-13.7 kg
PM change	+1.0 kg	+2.5 kg	+1.2 kg	+3.3 kg	+4.6 kg

Impacts on Water Resources

A Milford extension from Forge Park would operate entirely over a line that is now used for local freight service, but passenger service would result in a large increase in the number of trains using the line. This route makes six crossings of the Charles River or its tributaries on short open-deck wooden bridges. The cost estimates in chapter 5 assume that these would all be replaced with new bridges that would be provided with drainage systems to prevent pollutants such as brake dust and oil from being dropped in the water by trains. Additional drainage improvements would be made if necessary at other locations where the rail line is in close proximity to the river.

A Milford extension from Framingham would operate over a rail line that is mostly inactive. Several miles of track at the Milford end were dismantled 25 years ago. This line makes several long crossings of flood plains in Holliston and Milford, including those of Dopping Brook, Bogastow Brook, Lake Winthrop, Cedar Swamp, and Hopping Brook. Segments of the abandoned right-of-way near I-495 are frequently under water. The cost estimates in Chapter 5 include allowances for repair or replacement of deteriorated bridges over brooks. Additional drainage improvements would be required to prevent pollutants from the rail line from entering wetlands adjoining the right-of-way.

For extensions from either Forge Park or Framingham, pollutants dropped on sections of the railbed by trains would be in low concentrations. Except at the locations cited above, these would be unlikely to migrate to wetlands, waterways, or groundwater in significant volumes. Runoff of pollutants dropped in parking lots by autos would be a more likely problem, which would have to be dealt with by use of appropriate drainage systems and lot maintenance strategies.

On a Forge Park extension, a Bellingham Junction Station, regardless of precise location, would be near the confluence of the Charles River and Beaver Brook. A Milford station at Central Street would not be directly adjacent to the Charles River, but most other sites in Milford would be. Provision of adequate parking at Bellingham Junction or at Milford sites other than Central Street would be likely to require some filling of wetlands.

On a Framingham extension, a Lowland Street station in Holliston would adjoin the flood plain of Bogastow Brook. A Braggville station, if included, would adjoin that of Hopping Brook. Parking at any other likely station sites on the line might require some filling of wetlands.

Impacts on Community and Cultural Resources

This impact category covers changes that would occur to historic buildings, sites, or districts, to archeological sites, to parks or open spaces, and to buildings or resources that are important to the expression of cultural values, such as schools, churches, and monuments.

Most of the land adjoining the route between Forge Park and Milford is either undeveloped or is used for industrial purposes. The extension would not impact any areas that fall within the definition above.

The land along the right-of-way of an extension from Framingham is somewhat more developed. Several sites that fall within the definition above are near the route, but they would not be seriously impacted by rail service. In Framingham, the Memorial School is within 500 feet of the railroad, but is on the opposite side of Route 126. In Holliston, the Flagg Adams Junior High School is about 400 feet from the rail line and the Miller School is about 600 feet away. Both are separated from the railroad by Woodland Street.

Traffic Impacts on Major Arterial Routes

The reductions in auto travel resulting from any Milford extension alternative would be distributed over several different routes. The greatest reduction on any individual route would occur on the Mass. Turnpike east of Route 128. An extension from Framingham with peak-period express service would result in the largest all-day reduction, removing up to 450 cars each way at present travel levels. The highest concentration of these would occur between 8:00 and 8:30 A.M., when about 125 cars would be removed. This would be less than 2% of the capacity of this road over the same time span.

An extension from Forge Park with peak-period express service would remove up to 360 vehicles each way per day from the Mass. Turnpike east of Route 128. The reduction would be concentrated more heavily in the A.M. peak than that from a Framingham extension, so the largest 30-minute reduction would also be about 105 cars. All other alternatives would have smaller impacts on this route.

The greatest traffic reduction on an undivided state highway would occur on Route 126 north of Route 16 in Holliston. An extension from Framingham with peak-period express service would remove about 180 vehicles per direction per day from this segment. The reduction in the peak half hour would be about 55 vehicles, which would be insignificant. Without express service, the reductions would be about 120 vehicles each way per day, with 35 in the peak half hour. An extension from Forge Park would have a much smaller impact on this route.

Traffic Impacts of Station Access

On an extension to Milford from Forge Park with peak-period express service, boardings at present travel levels would be about equally divided between Milford (445) and Bellingham Junction (440). Origins of Bellingham Junction passengers would be more dispersed, resulting in greater reliance on auto access.

The most heavily used train at Bellingham Junction would have about 100 riders arriving by some form of auto access, compared with about 80 at Milford. In the final

minutes prior to train departure, auto arrivals would average about 11 per minute at Bellingham Junction and 9 per minute at Milford, but not all of these would approach either station from one direction. These arrival rates would be much lower than the peak rates at all of the existing stations on the outer end of the Franklin Line. On an extension from Forge Park with local service only, the peak train would generate about 85 auto-access trips to Bellingham Junction and 65 to Milford.

On an extension to Milford from Framingham with peak-period express service, boardings would be concentrated more heavily at Rocky Hill (545) than at Holliston (310) if the extension included only two stations. The most heavily used train at Rocky Hill would have about 125 riders arriving by some form of auto access, compared with about 50 at Holliston. In the final minutes prior to train departure, auto arrivals would average about 14 per minute at Rocky Hill and 6 per minute at Holliston, but not all of these would approach either station from one direction. On an extension from Framingham with local service only, the peak train would generate about 95 auto-access trips to Milford and 35 to Holliston. Peak utilization of Rocky Hill would be less if parking capacity constraints there required provision of a station at Braggville also.

Grade Crossings

The rail line from Forge Park to Milford has seven grade crossings of public roads. Six of these are between Bellingham Junction and Milford. (The Bellingham Junction station could be on either side of the seventh crossing.) Traffic counts have not been made at these crossings, but none of them appear to be heavily traveled ways.

The rail line from Framingham to the new Rocky Hill station site in Milford has 15 grade crossings of public roads. Several of the crossings are of local roads that appear to carry limited traffic, but there are three crossings of state highways that are important intertown routes. In Framingham Route 135 (Waverley Street) is crossed just outside Framingham Station, and Route 126 (Hollis Street) is crossed 0.3 miles further south. In Holliston, Route 16 (Washington Street) is crossed about one half mile north of the possible Lowland Street station site. Recent traffic counts at these crossings are not available. Based on counts at other points on these routes, traffic at the three crossings would average about 10,000 vehicles per day at Route 16, about 15,000 at Route 126, and about 20,000 at Route 135.

Impacts on Abutters

Negative impacts for residents of houses abutting a Milford extension would consist of noise and vibration from trains as they pass and the sounding of train horns at the grade crossings. These impacts would be greatest on houses located within 200 feet of the right-of-way.

Land in the immediate vicinity of the rail line from Forge Park to Milford is sparsely developed, and most of the existing development is non-residential. Only about 35 houses are within 200 feet of the route. Of these, 10 are between Forge Park and

Bellingham Junction, and 25 between Bellingham Junction and downtown Milford. Most of the latter are within one quarter mile of Central Street in Milford, and would be over 200 feet from the line if it terminated in the industrial area south of Depot Street.

Land along the rail line from Framingham to Milford is more developed than that along the line from Forge Park, and the Framingham extension would include twice as many miles of line without present passenger service. There are about 180 houses within 200 feet of the right-of-way between Framingham and Rocky Hill. About 45 houses are on the line segment south of Cross Street in Holliston, where no trains have run since 1972. Many of these houses were built after the rail service ended. Because of normal occupancy turnover, it is likely that a substantial percentage of the residents of the houses built before 1972 did not live there when trains were running.

About 90 of the houses within 200 feet of the line are on the segment between Cross Street and the auto yard in Framingham. Trains have not run on this segment since 1995. For many years prior to that, there had been at most one slow-moving local freight train per day in each direction. About 45 houses are along the segment between Framingham Station and the auto yard. This line is still used by trains of auto-rack cars, but the number of these per day is much less than the number of passenger trains that would be run on a Milford extension.

9. SUMMARY AND CONCLUSIONS

A commuter rail extension to Milford from either Forge Park or Framingham would be feasible from an operations standpoint but would produce very limited benefits for the costs involved. At current travel levels, stations on a Forge Park extension would serve about 725 inbound boardings on a typical weekday if all service were provided by extending trains that now terminate at Forge Park or Franklin. Of these riders, about 155 (21%) would be new transit users. The remainder would be diverted from other transit services. With peak-period express service, extension boardings would increase to 885 per day, of which 315 (36%) would be former auto drivers or passengers. The number of new transit users would increase only slightly, to about 180 with local service or 355 with express service by the year 2020.

An estimated 120 new transit riders would be attracted to existing Franklin Line stations by the express service. Without a Milford extension, peak-period express service from Forge Park would attract about 170 new transit users to existing Franklin Line stations at current travel levels. These totals would increase to about 200 and 250, respectively, by the year 2020.

Stations on a Milford extension from Framingham would serve about 655 inbound boardings on a typical weekday if all Milford trains ran in local service between Framingham and Boston. Of these riders, about 205 (31%) would be former auto drivers or passengers. The remainder would be diverted from other transit services. With peak-period express service, inbound boardings would increase to about 855 per weekday. Of these riders, about 405 (47%) would be new transit users. An additional 105 new transit riders would be attracted to existing Framingham/Worcester Line stations under the local service alternative, or 135 under the express service alternative. Although a Framingham extension would be somewhat more effective than a Forge Park extension in attracting new transit riders, a Framingham extension would also be far more costly to build and operate.

The maximum highway traffic impact of a Milford extension would be felt on the Mass. Turnpike east of Route 128. The reduction there in the number of peak-direction vehicles during commuting hours would be less than 2% of the total capacity of the road. Growth in travel by the year 2020 would increase ridership on the extension by less than 15% over the 1996 estimates.

Local trains on a Milford extension would have travel times ranging from 4 to 21 minutes longer than typical driving times to Boston from the vicinities of the extension stations. Express trains would provide line-haul travel times ranging between 7 minutes slower and 9 minutes faster than driving times. Express train times from Milford to Boston would be significantly shorter than current scheduled express bus times, but few Milford residents now use the buses. There is no through bus service to Boston from other towns that would be in the service area of a Milford extension.

Of the Milford extension alternatives analyzed, an extension from Framingham with peak period express service through to Boston and off-peak shuttle service between Rocky Hill and Framingham would have the highest ratio of incremental revenue to incremental operating cost. Including riders at extension station and new riders attracted to existing Framingham Line stations as a result of service improvements related to the extension, revenue for this alternative would cover about 22% of incremental operating cost. For comparison, in 1996, the revenue-to-cost ratio for the MBTA commuter rail system as a whole was about 42%. The second-highest revenue-to-cost ratio would be attained by a Milford extension from Forge Park with peak-period express service. For this alternative, the ratio would be 21%, including express train boardings at existing Franklin Line stations. Express service from Forge Park without a Milford extension would have a revenue-to-cost ratio of 18%. Milford service provided by extending present Franklin Line trains would also have a revenue-to-cost ratio of 18%.

A Milford extension from Framingham with peak-period express service and through local service to Boston in off-peak hours would have a revenue-to-cost ratio of only 12%. With through local service at all times, the ratio would drop to 10%

Capital costs for necessary right-of-way improvements, station platforms and parking, and additional rolling stock would total $42.0 million for an extension from Forge Park with local service only or $96.4 million for an extension with peak-period express service. For an extension from Framingham to Rocky Hill (near I-495) the capital cost would be $74.6 million with local service only or $102.5 million with peak-period express service.

Capital costs per new inbound transit rider at estimated year 2020 ridership levels for the various Milford extension alternatives are shown in Table 9-1. None of the alternatives examined would be among the more cost-effective commuter rail extensions examined by the MBTA recently. For comparison, the most recent estimate of the same measure for the Worcester extension is $45,732. For the Newburyport extension, the figure is $93,055.

Much of the new ridership on a Milford extension from Forge Park would consist of express train passengers boarding at present Franklin Line stations. When compared with a base-case of a line terminating at Forge Park with peak-period express trains, the capital cost per new transit trip for the Milford extension with express service rises to about $191,000. This would be much higher than the costs per new transit trip for the Worcester, Newburyport, or Old Colony Greenbush extensions, but would still be less than the costs for the other commuter rail extensions examined in the PMT.[22]

[22]Specific values for capital cost per new transit rider for projects in the PMT and for the Bourne and Central Mass. extensions are not included here because the results for those projects were based on older unit costs than were used in the Milford study.

Any of the Milford extension alternatives analyzed would improve air quality slightly. At present travel levels, the capital cost per weekday kg of VOC elimination would range from $3.9 million for a Forge Park extension with local service to $8.2 million for a Framingham extension with local service. These figures cannot be compared directly with those for commuter rail extensions analyzed in the PMT, because the latter were calculated by an older method that did not include increases in emissions from locomotives.

The findings in this chapter are summarized in Table 9-1.

Table 9-1
Summary of Performance Measures for
Milford Extension and Forge Park Express Alternatives

Item	Milford Extension from Forge Park: All Local	Milford Extension from Forge Park: With Peak Express	No Extension: Forge Park Express and Walpole Local	Milford Extension From Framingham: To Rocky Hill All Local	Milford Extension From Framingham: To Rocky Hill With Peak Express
Weekday Inbound riders at extension stations (1996 travel levels)	725	885	NA	655	855
New Transit Riders (New and existing stations 1996 travel levels)	155	435	170	310	540
New Transit Riders (year 2020)	180	555	250	335	590
Annual Operating Cost	$1,950,000	$4,130,000	$1,580,000	$7,190,000	$9,160,000
Incremental Fare Revenue (1996 travel levels)	$355,000	$855,000	$285,000	$685,000	$1,080,000
Incremental Revenue/ Operating Cost	0.182	0.207	0.180	0.095	0.118
Capital Cost	$41,975,000	$96,410,000	$38,275,000	$74,615,000	$102,535,000
Capital Cost/New Transit Trip (Year 2020 inbound)	$233,194	$173,712	$153,100	$222,731	$173,788
Weekday VOC Reduct. (1996 travel levels)	10.8 kg	21.0 kg	5.9 kg	9.1 kg	13.7 kg
Capital Cost/Kg of Weekday VOC Reduct.	$3,886,574	$4,590,952	$6,487,288	$8,199,451	$7,484,307

APPENDIX A - FURTHER DETAILS ON EXISTING PUBLIC TRANSPORTATION SERVICE IN STUDY AREA

Chapter 2 of this report provides general descriptions of the existing bus routes serving the Milford extension corridor directly or indirectly. The first section of this appendix describes the direct-service bus routes in greater detail. The second section contains transit ridership information for the Milford corridor.

Descriptions of Existing Bus Routes

Brush Hill Milford-Boston Route

Buses on this route originate at Main and School streets in downtown Milford and follow Main and East Main streets to state Route 109. They then proceed mostly on Route 109 to Route 128 in Dedham, and via Route 128 and the Mass. Turnpike into Boston. In Boston, buses stop at Copley Square, Park Square, and South Station.

The scheduled running time between downtown Milford and Copley Square is 65 minutes in each direction, with two minutes longer to Park Square or 12 minutes longer to South Station. In addition to downtown Milford, the buses make three other stops in that town, and also make several stops in Medway, Millis, Medfield, Dover, and Westwood. (The towns other than Milford would not originate significant numbers of riders for a Milford commuter rail extension.)

The School Street stop in Milford is about 0.2 mile from where a Central Street station would be located. The other stops in Milford include one at Routes 109 and I-495, about 0.5 mile from the Rocky Hill station site on an extension from Framingham. The bus running time to points in Boston from there is about six minutes less than from School Street.

LIFT Milford-Framingham Route

Buses on this route originate at Main and School streets in downtown Milford, at the same location as the Brush Hill Milford-Boston route, and follow state Route 16, Medway and Beaver Streets, and Route 16 again, to the center of Holliston. Route 126 is followed from there through Ashland to the Framingham commuter rail station. Buses then follow a circuitous route stopping at several malls in Framingham and Natick, including Shoppers World.

The scheduled running time between downtown Milford and the Framingham commuter rail station is 30 minutes each way. One inbound A.M. peak trip and one outbound P.M. peak trip provide train connections suitable for Boston commuting. The total travel time from downtown Milford to South Station via this combination would be one hour and 30 minutes outbound. Until December 1996, an inbound trip time of one hour and 25 minutes was possible. A train schedule change implemented then may require transfer passengers to wait for a later train, increasing travel time to one hour

and 42 minutes. These times compare with one hour and 17 minutes between Milford and South Station via the Brush Hill bus. With better schedule coordination, the fastest feasible travel time from Milford to South Station via a bus-train combination would be about one hour and 10 minutes.

LIFT buses will stop on request to pick up or drop off passengers at any point along the route. The School Street stop in Milford would be about 0.2 mile from a Central Street commuter rail station. The LIFT route also runs within 0.2 mile of the assumed Rocky Hill station site. The running time to Framingham from there is about 23 minutes, compared with a projected train time of 17 to 19 minutes from Rocky Hill.

In Holliston, the LIFT buses pass within 0.5 mile of the Lowland Street station site. The scheduled bus time from this point to Framingham Station is about 14 minutes, compared with a projected train time of 9 minutes from Lowland Street.

Census and Survey Transit-Ridership Totals from Milford Corridor

U.S. Census Journey-To-Work tabulations include breakdowns of work trips to Boston Proper, other Boston, and Cambridge from each city and town of residence, by mode of travel. Within modes, these figures do not indicate which route is used if there is more than one possibility, and commuters who alternate among two or more modes are counted under only one of them. Nevertheless, these data provide a general picture of the extent to which residents of individual towns use mass transit to travel to work. Information on origins, destinations and trip purposes of passengers using MBTA commuter rail, express bus and rapid transit lines is available from surveys conducted between 1993 and 1995. This provides a cross-check on the Census data. Results for towns in the service areas of Milford extensions from Forge Park or Framingham are summarized below. (Total commuter rail trips for all purposes from the same towns based on 1993 survey results appear in Table 2-1 in this report.)

Milford

Of the towns that would be served by a Milford commuter rail extension, Milford itself has the largest population. It also originates the largest numbers of Boston and Cambridge work trips of any municipality in the corridor of either extension alignment.

According to the 1990 Census figures, Milford originated 834 work trips to all of Boston or Cambridge, of which 109 (13%) were made by mass transit. Of these, commuter rail captured the largest share, with 84 (10%), followed by express bus with 17 (2%), and trolley or subway with 8 (1%). Comparisons with more recent MBTA survey data suggest that the overall transit share is understated in the Census figures, however. Expanded responses from the 1993 commuter rail survey show 141 work trips from Milford to Boston or Cambridge by that sub-mode alone. Other surveys show about 20 such trips on MBTA buses or rapid transit lines. The most common commuter rail boarding station for Milford residents was Forge Park, with smaller numbers boarding at Franklin or Framingham. Milford residents using MBTA express buses boarded at

Riverside, as did those using the Green Line. Some boardings at stations on the South Shore branch or the Red Line were also reported.

Bellingham

According to the 1990 Census figures, Bellingham originated 508 work trips to all of Boston or Cambridge, of which 138 (27%) were made by mass transit. All of these trips were shown as being made by commuter rail. The 1993 survey results showed a somewhat higher commuter rail share of this market, with 162 trips. Like the Census results, other MBTA surveys did not show any Bellingham residents on services other than commuter rail. Most Bellingham residents who used commuter rail boarded at Forge Park, but small numbers of boardings from Bellingham were reported at several other South Side stations.

Holliston

According to the 1990 Census figures, Holliston originated 751 work trips to all of Boston or Cambridge, of which 121 (16%) were made by mass transit. Commuter rail captured the largest share of these trips, with 106 (14%). The 1993 survey results were slightly higher, with 115 Boston or Cambridge work trips from Holliston by commuter rail. The Census showed 15 trips on other mass transit alternatives, compared with about 25 in survey results. Commuter rail boardings by Holliston residents were scattered among several stations, mostly on the Framingham/Worcester Line. Framingham Station alone accounted for half of the total.

Adjoining Towns

Individual towns that would adjoin those directly on a Milford extension have much smaller numbers of Boston or Cambridge work trips than Milford, Bellingham, or Holliston. The largest trip originator in this category is Woonsocket, Rhode Island, which adjoins Bellingham. The 1990 Census figures show 231 Boston or Cambridge work trips from Woonsocket. The 1993 survey results showed that 21% of these (49) were made by commuter rail, with Forge Park and Franklin Station being the main boarding locations. There were no survey responses from Woonsocket residents on other MBTA transit services, and no private-carrier bus routes provide direct links between Woonsocket and Boston. Woonsocket would be in the service area of a Milford extension from Forge Park, but not in that of an extension from Framingham.

Upton is the next-largest originator of Boston and Cambridge work trips among the adjoining towns, with 199 according to the Census figures. Only the southern half of the town would be better served by a Milford extension than by existing or planned stations on the Framingham/Worcester Line, however. The survey results showed only 21 Boston or Cambridge work trips from Upton by commuter rail, making an 11% mode share. About half of these boarded at Forge Park, and the rest at Framingham or West Natick. About five Upton residents were found in surveys of Green Line passengers. Upton has no direct mass transit service.

Hopedale, which adjoins Milford, had 109 Boston or Cambridge work trips according to the Census. The survey showed 43 of these (39%) on commuter rail, all boarding at Forge Park or Franklin Station. Another four Hopedale residents were found in surveys of Green Line passengers. Hopedale has no direct mass transit service.

The only other town adjoining one on a Milford extension would be Blackstone, which adjoins Bellingham. The Census showed 88 Boston or Cambridge work trips from Blackstone, and the survey showed 49 of these (56%) using commuter rail. All of these trips boarded at Forge Park or Franklin Station. Blackstone has no direct mass transit links to Boston.

Other Towns

In the demand forecasts in Chapter 4, the only other towns included in the service area of a Milford extension were Mendon, Uxbridge, and Douglas. All three were assumed to be served by an extension on either alignment. Of the three, Uxbridge had the greatest number of Boston or Cambridge work trips in the Census tabulation, with 106. The survey results showed only nine of these on commuter rail, all boarding at Forge Park. Mendon was second of the three, with 100 Boston or Cambridge work trips in the Census tabulation. The survey showed 15 of these on commuter rail mostly boarding at Forge Park. The Census showed only 21 Boston or Cambridge work trips from Douglas. The survey showed only two of these on commuter rail, boarding at Forge Park.

APPENDIX B - DETAILS OF TRAVEL TIME COMPARISONS BETWEEN MILFORD EXTENSION AND EXISTING OPTIONS

Travel times to Boston from stations on Milford extensions from Forge Park and from Framingham are discussed in chapter 3 of this report. Table 3-1 compares these times with estimated driving times to Boston. This appendix contains further details on the comparative times, and includes additional comparisons with present bus alternatives.

Milford

The scheduled running time for the present through bus route between Milford and Boston (described in appendix A) is 77 minutes to South Station or 65 minutes to Copley Square. With the times calculated above, an express train from Milford via Forge Park would save 18 minutes to South Station or 11 minutes to the Copley area compared with the scheduled bus times. A local train via Forge Park would, on average, save four minutes to South Station would but add three minutes to the Copley area compared with the bus times. Express trains via Framingham would have line-haul times about six minute faster than express trains via Forge Park, and local trains via Framingham would be about seven minutes faster than local trains via Forge Park. For most users of a Milford station, however, access time to the terminal of an extension from Framingham would be about 5 minutes longer than that to the terminal of an extension from Forge Park.

Compared with the fastest feasible combination of a feeder bus connecting at Framingham with an express train, a local train via Forge Park would take about three minutes longer to either South Station or Copley. An express train via Forge Park would save 11 minutes to either Boston station. Relatively few Milford residents use the present through or feeder bus options to travel to Boston, however.

As shown in Table 2-1, and discussed in chapter 2, the majority of trips from Milford to Boston via public transportation are now made by boarding Franklin Line trains at Forge Park. This would still be an option after the construction of a Milford extension. In the 1993 survey, reported station access times for Milford residents who drove to Forge Park averaged about 14.5 minutes. Their reported home addresses were distributed throughout the residential sections of Milford, but most were in the part of town north of state Routes 16 and 140 and west of Routes 85 and I-495. This is where the majority of homes in Milford are located. Presumably, Milford residents who commute to Boston by means other than commuter rail have a similar distribution of home addresses.

The survey did not determine specific routes used for commuter rail access, but for most Milford respondents the fastest route to Forge Park would have run through or near downtown Milford. Responses for trips originating near the town center indicate that average driving time from there to Forge Park is about 12 minutes. As discussed in chapter 3, train times to Boston from a Milford station on an extension from Forge Park would be about 11 minutes longer than the times for the same trains from Forge Park

Station. Milford residents who currently drive directly past the Milford station site on the way to Forge Park would save about one minute of total travel time by boarding at Milford. Those who would have to add new links to their access paths to reach a Milford Station would save less than one minute.

A passenger boarding an express train at the Rocky Hill station on an extension from Framingham would have on-train time to Boston about five minutes longer than would be incurred by boarding an express train at Forge Park. For most such passengers, access time to Rocky Hill would be about seven minutes faster than that to Forge Park, so the net travel time saving via Rocky Hill would be about two minutes. (This differential would apply if there were only one station in Holliston. A second Holliston station would add two minutes to the running time from Rocky Hill.)

For most Milford residents, the main advantage of using a Milford station on either extension alignment compared with present commuter rail options would be shorter access distance rather than reduced total travel time. Almost all Milford residents who now use commuter rail reach their boarding stations by driving alone, carpooling, or being dropped off. For some of them, a Milford station would add the option of walk-in access. In the 1993 commuter rail survey, among passengers who reported walking as their mode of access to the outer boarding station, 96 percent reported access times of 20 minutes or less. At typical walking speeds, this would mean that most walk-ins had access distances of under one mile. About 20% of respondents from Milford had trips starting within one mile of a Central Street station site. About 15% had origins within one mile of Rocky Hill.

The most direct driving routes between Milford and Boston are over old state highways with uncontrolled access and relatively low average speeds. Travel time runs have not been conducted recently over the full lengths of any of the routes. The fastest driving route is probably north on I-495 from Milford to Westborough and east on the Mass. Turnpike from there to Boston. Based on observed travel times on segments of this route, and on past express bus schedules on the same alignment, the driving time from downtown Milford to South Station would be about 52 minutes. As shown in Table 3-1, the travel times from Milford to South Station on an express train via Forge Park would be fairly close to this, at 59 minutes via Forge Park. From the vicinity of Rocky Hill, driving time to Boston would be about 49 minutes, compared with 53 minutes for an express train. The time to South Station on a local train would be 73 minutes from Central Street via Forge Park or 66 minutes from Rocky Hill via Framingham. For current auto users, these would represent insignificant changes from present rail options.

Bellingham

For Bellingham residents, the most commonly used mass transit alternative for travel to Boston or Cambridge is also commuter rail from Forge Park. In the 1993 survey, station access times reported by Bellingham residents who drove to Forge Park averaged about 8.5 minutes. The layout of roads in Bellingham and Franklin requires that most

Bellingham residents pass through or near Bellingham Center to access Forge Park. The survey results indicate that the driving time to Forge Park from the vicinity of Bellingham Center is about 5 minutes. Access to a station at Bellingham Junction would replace the driving segment from Bellingham Center to Forge Park with one from Bellingham Center to the new station. For the average Bellingham resident, this would result in a net reduction of about 4 minutes in station access time.

Based on the figures above, train times to Boston from a Bellingham Junction Station would be 5 minutes longer than times from Forge Park. Therefore, for most Bellingham residents, combined access and on-train time would be one minute longer via Bellingham Junction than via Forge Park. As in Milford, the main advantage of using the new station compared with using Forge Park Station would be convenience of shorter access distance. In the survey, reported home addresses in Bellingham were distributed throughout the town, but about 40% originated within a one mile radius of Bellingham Junction. This is the area in which most walk-in access to the station would originate. In contrast, fewer than 2% of access trips to Forge Park from Bellingham are made by walking.

The fastest driving route from Bellingham to Boston is probably similar to that from Milford, that is, north on I-495 to Westborough and east on the Mass. Turnpike from there. Based on observed travel times on segments of this route, the driving time from Bellingham Center to South Station would be about 57 minutes. As calculated above, the travel time from Bellingham Junction to South Station on an express train via Forge Park would be faster than this, at 53 minutes. The time to South Station on a local train via Forge Park would be 67 minutes. For current auto users, the latter time would represent an insignificant change from present rail options.

Holliston

For Holliston residents, the most common mass transit choice for travel to Boston is commuter rail, with most of the ridership going to the Framingham/Worcester Line. As shown in Table 2-1, boardings by Holliston residents are divided among several stations. Of the 127 weekday inbound commuter rail trips originating in Holliston in the 1993 survey, nearly half (63, or 49.6%) were made by boarding at Framingham Station. West Natick was the second most common boarding location with 27 (21.3%), followed by Wellesley Square with 18 (14.2%). The only other stations with more than one Holliston boarding each were Wellesley Hills, with 6 (4.7%), and Natick, with 5 (3.9%).

Nearly all Holliston respondents used some form of automobile access to reach their boarding stations. The vast majority (79.3%) drove or rode in cars parked at or near stations. Another 16.1% were dropped off, and 3% arrived by taxi. One passenger rode a bicycle from Holliston to Framingham. Although it is possible to use LIFT Bus Route 6 to connect from Holliston to Framingham Station, no survey respondents reported doing so.

The distribution of boardings by stations is as would be expected based on the access routes from Holliston to the various stations. State Route 126, which runs through the town on a south-north alignment, leads directly to Framingham Station. Route 126 also connects there with Route 135, which runs past West Natick and several other stations on the Framingham/Worcester Line. Route 16, which runs through Holliston from southwest to northeast and overlaps Route 126 for part of the way, leads directly to Wellesley Square and Wellesley Hills, and connects in Sherborn with Route 27 to Natick.

Holliston residents boarding at West Natick reported the shortest average access times, at 14.9 minutes, followed by those boarding at Framingham (16.0 minutes) and Natick (16.5 minutes.) The shorter average access time at West Natick despite greater distance from Holliston Center was a result of a higher proportion of addresses in northern sections of Holliston among the West Natick users.

The driving time to Framingham Station from the potential Lowland Street station site in Holliston is about 15 minutes. Including dwell time at Framingham, the estimated train time from departing Lowland Street to departing Framingham would be about 10 minutes. Therefore, for trips originating in the immediate vicinity of the Lowland Street station, boarding a train there would save about 5 minutes compared with boarding at Framingham.

Most drivers currently going to Framingham Station from points in Holliston would not go directly past the Lowland Street station site. For trips originating further south than the northern dividing point between Routes 16 and 126, access to Lowland street would require a diversion of about 2 minutes from the present driving route, resulting in a net time saving of about 3 minutes by boarding there. Based on survey results, about half of the Holliston residents, using Framingham Station would be in this category. The rest have origins further north along the Route 126 corridor.

For Holliston residents boarding at West Natick, reported access times ranged from 10 to 20 minutes, with only 20% exceeding 15 minutes. Train time from departing Lowland Street to departing West Natick would be 14 minutes. Including access time to Lowland Street, most passengers would increase their overall travel times by boarding there instead of West Natick. Comparisons with times at other stations used by Holliston residents yield similar results. Therefore, as would be the case for stations in Milford or Bellingham, the main advantage of a Lowland Street station in Holliston would be shorter access distance rather than faster overall travel time. In addition, passengers boarding in Holliston would no longer have to compete for scarce parking spaces at stations on the Framingham /Worcester Line. All of the stations on the Framingham/Worcester Line are beyond walking distance from any point in Holliston, but about one third of the Holliston survey responses showed trip origins within one mile of the Lowland Street site.

The Stone & Webster study was unable to identify a specific site suitable for a second station in Holliston, but the running time calculations in that report implied that the

second station would be near the former Braggville site. This location is in the southwest corner of the town, near the border of Milford. Most Holliston residents would have to backtrack to reach a Braggville station, and would therefore find it less attractive than the Lowland Street station. (Fewer than 3% of Holliston survey responses showed trip origins within one mile of Braggville.) An alternative site at the Hopping Brook Industrial Park, rejected in the S &W report because of limited potential parking capacity, would be only slightly more convenient than Braggville.

Automobile travel time runs have not been conducted for complete trips from Holliston to Boston. From points north of Holliston Center, the fastest routing is probably via state routes 126 and 30 to the Mass. Turnpike at Exit 13 in Framingham. Based on the segments of this route for which travel time data are available, the average A.M. peak driving time to the South Station area would be about 54 minutes from the vicinity of Lowland Street. Therefore, even with local service, rail times from a Lowland Street station would be competitive with driving times.

From points south of Holliston Center, the fastest driving route is probably west on Route 16 to I-495 and north to the Mass. Turnpike at Westborough, although this requires some backtracking. From the vicinity of Braggville, driving time to South Station via this routing would be about 50 minutes. The time from a Braggville station by express train would be very competitive with this, but local train time would not be.

APPENDIX C - CALCULATION OF ROLLING STOCK REQUIREMENTS FOR MILFORD EXTENSIONS

Rolling stock requirements for each Milford extension alternative were calculated in terms of the number of locomotives and coaches that would be required to operate the schedule including the extension but would not be required without it. Each train would have one locomotive. Coach requirements were based on provision of seats for all new peak-period riders, using double-deck coaches with 185 seats each. (These estimates may be low, as demand would not necessarily divide among trains in even multiples of 185.) Table C-1 summarizes the ridership components that were considered in computing coach requirements for each alternative.

The assumed schedule for express service on a Milford extension from Forge Park would include five inbound A.M. peak trains and five outbound P.M. peak trains. It would not be possible for any train set to complete a round trip from Milford to Boston fast enough to cover more than one departure in either peak period, so five train sets would be needed for the five trips. This would be the same as the requirement for the present Forge Park service.

At present, peak-period Norwood Central and Walpole short-turns are run with train sets that first make other peak trips, so the short-turns require no additional equipment. Under the Milford express alternative, two of the five Walpole short-turns could be covered by train sets that also did Milford trips. Three additional sets would be needed for the other three Walpole trips, requiring three locomotives. Coaches for these trains would be part of the overall Franklin Line pool, which would be expanded for Milford service as described below.

With a typical split of peak and off-peak ridership, 750 of the 885 predicted inbound weekday boardings at Milford and Bellingham Junction would take place in the A.M. peak. This would include about 420 riders who would otherwise use stations on the present Franklin Line, about 60 riders diverted from other transit services, and about 270 new transit riders. In addition, about 240 A.M. peak riders would shift to existing Franklin Line stations from autos or from other transit facilities. Capacity for the 420 riders diverted to the extension from present Franklin Line stations would be provided by redeploying cars from the existing fleet. Three additional double-deck coaches would be needed to provide seats for all 570 of the riders added at Milford extension and Franklin Line stations combined.

The present policy of including a minimum of six coaches in each train set would require a total of 18 coaches for the three new train sets required for this alternative, but three of these could be provided by shortening Franklin Line trains that now run seven cars. The net total of 15 coaches required to maintain six-car train lengths would exceed that needed for capacity alone, and would therefore be the controlling consideration in determining the equipment requirement.

If all Milford service were provided by extending trains that would run as far as Forge Park anyway, no additional locomotives would be required. Of the predicted 725 weekday riders at extension stations, 625 would board A.M. peak trains. This would include about 135 new transit riders and about 60 riders diverted from transit services other than the present Franklin Line. No new boardings would be attracted at present Franklin Line stations. Slightly more than the capacity of one coach would be needed for the total of 195 riders added to the extended Franklin Line.

Schedules of trains on a Milford extension from Framingham would have to be coordinated with those of schedules of trains originating at Worcester and at Framingham. With the currently planned schedules of those trains, express service from Milford would be limited to four trips in the A.M. peak rather than the five that would be run via Forge Park. No train set would be able to cover more than one trip, so four train sets and four locomotives would be needed.

With a typical split of peak and off-peak ridership, 725 of the 855 predicted inbound weekday boardings at Milford and Holliston would take place in the A.M. peak. This would include about 130 riders who would use present stations on the Framingham/Worcester Line if there were no Milford extension, about 250 riders diverted from other transit services, and about 345 new transit riders. Another 215 new riders would be attracted to present Framingham/Worcester Line stations as the result of freed-up parking capacity and additional service frequency. Capacity for riders diverted to the extension from Framingham/Worcester Line trains would be provided by redeploying cars assigned to that line. Five more coaches would be needed to provide seats for the net of 810 riders added at all Milford extension and Framingham/Worcester Line stations combined. Four of these could be provided by shortening existing trains from seven cars to six, leaving a net requirement of one coach based on capacity considerations. With a minimum of six coaches on each of the four new train sets, a total of 24 would be assigned, of which four would be shifted from other trains and 20 would need to be acquired.

The planned schedule for the Framingham/Worcester Line calls for four local trains to originate at Framingham in the A.M. peak, but for all P.M. peak trains to be run through to Worcester. It would be feasible to extend the A.M. peak Framingham locals to Milford. Two of the P.M. peak local trains could be diverted to Milford instead of Worcester with little impact on stations west of Framingham on the Worcester route. Two other Worcester locals could be replaced by trains running non-stop as far as West Natick or Framingham, with service to intermediate stops being provided by new local trains to Milford. This strategy would require the assignment of two additional train sets and two locomotives to the line.

Of the estimated 625 weekday boardings at extension stations, 530 would take place in the A.M. peak. This would include about 150 new transit riders and 250 riders diverted from transit services other than the Framingham/Worcester Line. Another 155 new riders would be attracted to present Framingham/Worcester Line stations as the result of freed-up parking capacity. Three more coaches would be needed to provide seats for

the net of 555 riders added at all Milford extension and Framingham/ Worcester Line stations combined. With a minimum of six coaches on each of the two new train sets, a total of 12 would be assigned, of which four would be shifted from other trains and eight would need to be acquired.

Table C-1
Sources of A.M. Peak Ridership on Milford Extension
and New Coach Capacity Required

	From Forge Park		From Framingham	
Ridership Category	With Peak Express	All Local	With Peak Express	All Local
All-Day Boardings at Ext. Stas.	885	725	855	625
A.M. Peak Boardings at Ext. Stas.	750	615	725	530
Diversions from Franklin Line	420	420	190	190
Diversions From Framingham Line	20	20	130	130
Diversions From Other Transit	40	40	60	60
New Transit Riders	270	135	345	150
A.M. Pk New Boardings on Present Franklin Line	240	0		
A.M. Pk New Boardings on Present Framingham Line			215	155
New A.M. Peak Capacity Needed	570	195	810	555
Additional Coaches Needed @ 185 seats	3.1	1.0	4.4	3.0

APPENDIX D - FURTHER DETAILS ON OPERATIONAL ISSUES

Impacts of Forge Park Extension on Route South of Readville

At present, the Franklin Branch is mostly single tracked. There is a 5-mile segment of double track between Sprague Street, one-third of a mile south of Readville, and Norwood Central Station. There is also a passing siding just south of Walpole Station. Current Franklin Line schedules (effective May 1997) include several inbound trains that pass outbound trains on the double-track section between Sprague Street and Norwood Central. The scheduled passing point is not the same in all cases. The closer it is to the end of the double track, the greater is the chance of a train on the double track being delayed by the late arrival of a train leaving the single track.

Only one pair of trains has a scheduled meeting point at the Walpole passing siding. The present layout of the track and switches there increases the running time between Norfolk Station and Walpole Station by 7 to 8 minutes for the train that goes into the siding compared with trains that stay on the main track.

If Milford service were provided entirely by extending trains that would otherwise terminate at Forge Park or Franklin Station, the total number of trains running on the Franklin Line would be either unchanged or slightly reduced from the base case. A layover facility at Milford would permit the elimination of non-revenue trips between the Franklin layover facility and Forge Park, reducing peak-period scheduling constraints on that segment. Some early-morning and late-evening trains now operating between Boston and Forge Park primarily for equipment positioning would likely be dropped as well. As explained below, it would not be possible to maintain the existing schedules of all remaining trains north of Forge Park, however.

A locomotive-propelled train used in push-pull service,[23] as all MBTA trains currently are, requires a minimum time allowance of about 10 minutes to reverse direction after arriving at the end of a trip. (Most of this time is occupied in performing a mandatory air-brake test after the engineer has walked from one end of the train to the other.) The estimated running time from Forge Park to Milford would be about 11 minutes in each direction. Therefore, the only trains that could retain their existing schedules in both directions north of Forge Park would be those that have scheduled layover times of at least 32 minutes between outbound arrival and inbound departure at Forge Park.

Currently, of 13 trains that are scheduled to turn from outbound to inbound trips at Forge Park, 10 have scheduled layover times of under 32 minutes; of these, 6 have scheduled layovers of only 10 to 13 minutes. Therefore, the Milford extension would require that most trains leave Boston earlier or arrive at Boston later than at present. The changes would have to be made in a manner that would not create conflicts between inbound and outbound schedules on single-track segments.

[23] A train in push-pull configuration can be operated either from the locomotive (pull mode) or from an engineer's cab in the coach at the opposite end of the train (push mode).

For service with peak-period Milford express trains supplemented by local Walpole short-turns, changes in the number of trains by segment would depend largely on the overnight basing strategy for the Walpole trains. With the express trains replacing present trains south of Walpole, the greatest increase in train frequency would occur on the single-track segment between Walpole and Norwood Central. This segment would, at minimum, have increases of four inbound trips in the A.M. peak and five outbound trips in the P.M. peak compared with present service. North of Norwood Central, the respective increases would be three and four trips.

Because of capacity constraints at the Southampton Street yard in Boston, additional rolling stock for the Walpole short-turns would need to be based overnight at some point on the Franklin Branch. There is no room for a layover facility at or near Walpole station, so the most likely scenario would be for Walpole trains to be based at the present Franklin facility, with trains now based there being shifted to a new facility in Bellingham. With maximum equipment utilization, two of the train sets used in Walpole service would make two peak-direction trips in each peak period, so they would also make two off-peak direction trips during each peak. These would be in place of one outbound trip to Walpole and one to Norwood Central in the A.M. peak, and one inbound trip from Norwood Central in the P.M. peak under the present schedule. Basing Walpole train sets at Franklin would also add three peak-direction trains between Franklin and Walpole during each peak period. (These could run either in revenue service or empty from the layover to Walpole.)

Schedules of all trains would need to be arranged not only to prevent conflicts between inbound and outbound trips on the single-track sections, but also to prevent local trains from being overtaken by express trains. Under the schedules assumed for purposes of analysis, a train running non-stop from Walpole to Ruggles with no delays and a top speed of 60 m.p.h. on the Franklin Branch would pass Readville 11 minutes after leaving Walpole. A train running in local service would depart Readville 26 minutes after leaving Walpole. To provide a minimum separation of 3 minutes between a local train and the following express train at Readville, the local would have to leave Walpole 18 minutes ahead of the express. Each minute of additional time separation at Readville would require an increase of one minute in departure separation at Walpole. Therefore, with express and local trains each leaving Walpole on 30-minute headways, it would be impossible to provide combined uniform 15-minute headways there. Running express and local trains each on 35-minute headways would allow more uniform separation, with alternating 17 and 18-minute intervals at Walpole.

Impacts of Forge Park Extension on Route North of Readville

Most Franklin Line trains run via the New Haven to Boston or NHB Main Line between Readville Station and South Station. This route segment has three tracks, which Franklin Line trains currently share with commuter trains originating at Stoughton, Attleboro, South Attleboro, and Providence, Rhode Island, and with Amtrak intercity passenger trains from New York City and points south. Between Forest Hills and South Station, the same tracks are also used by Needham Line commuter trains.

From west to east, the three tracks are identified as Tracks 3, 1, and 2. Track 2 is normally used only by inbound trains north of Readville. Track 3 is used in both directions north of Forest Hills, but is normally used only by outbound trains south of there. Track 1 is used by trains in either direction for the entire distance north of Readville.

A Milford extension served entirely by lengthening the runs of existing Franklin Line trains would not change the total number of peak-period trains using the shared tracks. As discussed above, the additional running time between Milford and Forge Park would necessitate many changes in Boston arrival or departure times of Franklin Line trains. Changes that would affect the NHB Main Line would be likely to occur during mostly during off-peak hours, however. North of Readville, Franklin Line service consisting of Milford express and Walpole local trains during peak hours would result in minimum increases of three inbound trains in the A.M. peak and of four outbound and one inbound trains in the P.M. peak.

As of May 1997, the segment of the NHB Main Line between Readville and South Station was used by scheduled totals of 36 trains between 6:30 and 9:30 A.M. and 37 between 4:00 and 7:00 P.M. on weekdays. This was an average of four trains per track per hour. Overall use was less than the combined theoretical capacity of the three tracks, but the available time slots would not all be optimal for a schedule with alternating local and express trains from the Franklin Line. The frequency of other trains using the shared line will increase following completion of Amtrak's Northeast Corridor Electrification project, scheduled for 1999. Planned commuter rail trains from New Bedford and Fall River may also be routed over this line.

The link between the Franklin Branch and the NHB Main Line at Readville consists of a single-track segment connecting directly only with NHB Track 3. Franklin Line trains using Tracks 1 or 2 north of Readville must cross over to or from Track 3, so service on all three tracks can be affected by the operation of Franklin trains. With the present track arrangement, if a late-arriving inbound Franklin train prevents an outbound train from entering the single connecting track on schedule, the outbound train must stop and wait on one of the NHB main tracks. Present schedules are designed to minimize the possibility of such conflicts, but they could be more difficult to avoid with expanded Franklin Line service.

The feasibility of adding Milford express trains to the NHB Main Line would need to be determined by a more detailed analysis than was possible for this study. If capacity of that line was found to be insufficient, it would be possible to route some trains from any of the routes except the Needham Line via the Dorchester Branch (Fairmount Line) between Readville and South Station. As of May 1997, this two-track line was used by only 13 trains between 6:30 and 9:30 A.M. and 14 between 4:00 and 7:00 P.M., leaving substantial additional capacity. The connection between the Franklin Branch and the Dorchester Branch crosses over the NHB Line on a bridge, eliminating any direct conflict with traffic on that line.

The main disadvantage of a Dorchester Branch routing is that it bypasses Back Bay and Ruggles stations, making service less convenient for many passengers. (Alighting counts taken in conjunction with the 1993 commuter rail survey showed that 40% of Franklin Line passengers and 43% of Attleboro/Stoughton Line passengers on A.M. peak trains alighted at Back Bay or Ruggles.) Despite lower maximum speeds for commuter trains (60 m.p.h. versus 80 m.p.h.) the fastest scheduled running times between Readville and South Station on the Dorchester Branch are currently slightly less than the fastest times on the NHB Line (18 minutes versus 19). This is possible because of the half-mile shorter distance and the omission of Back Bay and Ruggles dwell times on the Dorchester Branch.

Impacts of Framingham Extension on Framingham/Worcester Line

The Framingham/Worcester commuter rail line is mostly double-tracked, but there is a 1.6-mile single-track section adjoining the Conrail Beacon Park freight yard in Allston. On the double-track segments, the tracks are numbered 1 and 2 from north to south. signaling on both tracks allows trains to operate in either direction on either track. Crossovers at a point known as CP 11 between Wellesley Farms and Auburndale allow trains in either direction to change tracks.

With conventional right-hand running, Track 1 would be outbound and Track 2 would be inbound. Because of the present platform layouts at several stations, however, trains in either direction making local stops are run on Track 2 if possible. At Newtonville, West Newton, and Auburndale there are platforms only on the Track 2 side. When trains stop on Track 1 at these stations, passengers must cross Track 2 on narrow boardwalks to board or alight. All other stations on the line have platforms for both tracks, but at Wellesley Farms, Wellesley Hills, and West Natick the Track 1 platforms can be accessed only by walking across both tracks from the opposite platforms. These platform arrangements place constraints on the locations and times at which trains on one track can be scheduled to pass trains on the other. Typically, when trains on Tracks 1 and 2 are scheduled to arrive at about the same time in a station where Track 1 passengers must cross Track 2, the train on Track 2 is held outside the station until the train on Track 1 has departed. Alternatively, at two-platform stations with pedestrian crossings, a Train on Track 1 may be held in the station to block alighting passengers from crossing the tracks until the train on Track 2 has passed. In either case, overall running times for one or both trains are increased.

The present Framingham/Worcester Line schedule has 19 inbound and 18 outbound trains on weekdays. The line is also shared with a few Amtrak intercity trains from points west of Worcester. The A.M. peak commuter train schedule now includes three inbound Framingham trains making all stops and three inbound Worcester trains making various combinations of stops. There are also three outbound Framingham trains making limited stops in the A.M. peak. The number of P.M. peak trains is the same as that in the A.M. peak, but with the directions reversed.

The anticipated schedule after full implementation of Worcester service will include four inbound Framingham local and four inbound Worcester express trains plus three outbound Worcester locals in the A.M. peak. This will be an increase of two inbound trips compared with present service. In the P.M. peak, it is expected that there will be four Worcester expresses and four Worcester locals outbound and three Worcester locals inbound. This will be an increase of two outbound trips compared with present service.

Trains on a Milford extension from Framingham would use the same tracks as Framingham and Worcester trains between Framingham and Boston. If the extension were served by trains making local stops east of Framingham at all times, Milford trains would replace Framingham local trains in the A.M. peak, so there would be no change in the total number of trains east of Framingham in this time period. With train sets for peak Milford service based at a layover facility on the Milford extension, trains that would otherwise be needed only for equipment positioning could be eliminated. This would include one outbound trip from Boston to Framingham before the A.M. peak and two inbound non-revenue trips between Worcester and Framingham during the A.M. peak.

The anticipated base-case schedule does not include any Framingham short-turns in the P.M. peak, but two Worcester locals leaving Boston close behind Worcester expresses could be run to Milford instead. This would still require adding two Milford trains outbound and one inbound during the P.M. peak to provide the level of service assumed in the demand analysis. If peak-period trains on a Milford extension were run express east of Framingham, this would add at least four inbound A.M. peak and four outbound P.M. peak trains to the base-case service.

In addition to the constraints of single track at Beacon Park and those of station layouts, the time slots available for operation of Milford trains would be limited by the need to prevent local trains from being overtaken by express trains on the same tracks. At present, scheduled running times for trains running non-stop between West Natick and Back Bay are 13 to 15 minutes faster than those of trains making all local stops. To maintain a minimum separation of 3 minutes at Back Bay with no delays, an express train could not follow a local by less than 16 to 18 minutes at West Natick. Longer time separations at Back Bay would require correspondingly longer time separations at West Natick. The bi-directional capability of the tracks on this line allows faster trains to pass slower trains moving in the same direction, but this requires additional coordination with schedules of trains running in the opposite direction.

During off-peak hours, Milford service running through to Boston would add as many as seven trains in each direction, or an increase of about 50% over the planned schedule of Framingham and Worcester trains. Because of relatively long intervals between trains, this should not pose a problem. If off-peak Milford service were operated with shuttle trains to Framingham, there would be no change in the number of trains running between Framingham and Boston.

There is insufficient room at the Framingham station to provide a special platform for Milford shuttle trains there, so they would have to share platforms with the through trains. The present track layout would give Milford trains access only to Track 2 at Framingham. Addition of a crossover to Track 1 would improve operating flexibility for through trains, but would be of limited benefit for shuttles. Trains would have to stop clear of the Concord Street grade crossing east of the platforms. Because of the short distance between Concord Street and the end of the Milford line, a Milford train longer than three cars stopped on Track 1 would also block Track 2. Off-peak ridership would not require trains longer than three cars, but off-peak trains are usually operated with the same equipment as peak trains. Schedules would need to include enough time for inbound Milford shuttle trains to pull into the Framingham station, discharge passengers, and move clear of the main line tracks before the arrival of the through service connection. Outbound Milford trains would pull into the station after the departures of the connecting trains.

Impacts at South Station

Milford trains running via either Forge Park or Framingham would have South Station as their Boston terminal. South Station currently has 13 tracks. Service on the Old Colony Lines, scheduled to begin in September 1997, will require the exclusive use of two tracks. This will leave 11 tracks to be shared by all other commuter and intercity trains using the station.[24] Track layout allows access to all station tracks from all entering routes, but not all platforms are suitable for all trains. Because of the irregular shape of the station, platform lengths are not uniform, and capacities range from 6 to 14 cars.

The number of tracks needed to serve all routes using South Station depends on the service frequency on each route and on the length of time that each train is in the station. All tracks end at the station, so all trains must reverse direction between arrival and departure. A train in the station may turn from an inbound to an outbound revenue trip, arrive from the yard and depart on a revenue trip, or arrive from a revenue trip and proceed to the yard. Regardless of which of these is the case, a train in the station usually occupies a track for a minimum of 10 minutes. Including time to enter and leave the station, a train effectively occupies a track for at least 15 minutes, resulting in a maximum capacity of four trains per track per hour. Schedules often call for trains to remain in the station longer than the 10-minute minimum because inbound arrivals times cannot all be matched that closely with scheduled departures. Trains going to the yard may have to wait in the station until yard space is clear or until a switching crew is available.

Under the schedules in effect in May 1997, there were 38 scheduled train arrivals in South Station between 6:30 and 9:30 A.M., or an average of only 1.1 arrivals per hour

[24]Two of the 13 tracks were added in conjunction with the Old Colony restoration. They are not normally required for present service on other lines, but are sometimes used when construction work blocks other tracks in the station.

per track. Throughout most of this span, the number of tracks occupied simultaneously did not exceed seven. There was, however, a brief time around 9:00 A.M. when 11 tracks would all be occupied. Similarly, between 3:30 and 6:30 P.M. there were 36 scheduled departures. The number of tracks occupied simultaneously seldom exceeded seven, but 11 tracks were in use briefly around 4:30, and 10 tracks were in use around 5:00. These conditions imply that South Station could accommodate a greater number of trains than it does at present even after the addition of Old Colony Lines service, but a more detailed analysis would be needed to determine how well the available time slots match the needed arrival and departure times of new trains.

APPENDIX E - FURTHER DETAILS ON HOLLISTON SECONDARY TRACK RIGHT-OF-WAY IN MILFORD

Summary

The segment of the Holliston Secondary Track between Metcalfs Station in Holliston and Central Street in Milford was abandoned in 1972 and dismantled shortly thereafter. Most of the right-of-way of this segment is still unobstructed, but several sections in the 1.5 miles nearest Central Street have been obliterated by redevelopment. The first section of this appendix summarizes legal issues concerning the status of this segment of the line. This is followed by the results of a field inspection of this segment conducted by CTPS in 1997. The present obstructions of the right-of-way would not be insurmountable obstacles to restoration of rail service through to Central Street on this route should this otherwise prove to be the best alternative. As shown in the final sections of the appendix, however, even if the right-of-way in question were still unobstructed, a commuter rail extension using it would rank low in all of cost-effectiveness criteria used.

Background of Abandonment and Partial Sale of Right-of-Way

The last operator of the segment of the Holliston Secondary Track in Milford was the Penn Central Transportation Company. On July 2, 1972, Penn Central was granted permission by the Interstate Commerce Commission to discontinue service on the segment of the Holliston Secondary between Metcalfs Station in Holliston and Milford Station at Central Street. Under laws in effect at that time, this left Penn Central free to remove the track and to sell the right-of-way to any interested buyers. The track was removed shortly after that, but Penn Central retained ownership of the right-of-way for a time, presumably because of a lack of purchase offers.

Subsequent to the abandonment of the south end of the Holliston Secondary, the Massachusetts legislature enacted two statutes intended to help preserve former rail rights-of-way. Chapter 963 of the Acts of 1973 provided that no municipality could issue a building permit for a structure to be built on lands formerly used for railroad rights-of-way or property appurtenant thereto without holding a public hearing and without receiving written permission from the secretary of the Executive Office of Transportation and Construction (EOTC).

Chapter 859 of the Acts of 1975 contained a section providing that no railroad company could sell or dispose of rights-of-way in the Commonwealth without first offering the same for sale to EOTC or a public agency designated by EOTC. Upon receipt of any such offer, EOTC was required to act on it within 90 days in order to retain the first right of purchase.

In 1976, pursuant to Chapter 859 of the Acts of 1975, Penn Central offered to sell to EOTC four parcels of land in Milford, including the segment of the Holliston Secondary right-of-way between Central Street and the south end of Parkhurst Street. EOTC in

turn recommended that the town of Milford purchase these parcels, but the town lacked funding for the offering price of $72,000. As a result, the four parcels were sold to private developers. Plans submitted to EOTC by Penn Central showed that a portion of the right-of-way immediately to the north of the four parcels had been sold previously, possibly before Chapter 859 was enacted.

Following the sales of these right-of-way segments, they were still afforded some protection under Chapter 963 of the Acts of 1973. Nevertheless, an inspection by CTPS in January 1997 found that several structures had been built either directly on the former right-of-way in Milford or so close to it as to be incompatible with future rail operation. Further research would be required to determine whether all applicable statutes were complied with before these structures were built. In any case, it would be necessary either to acquire and remove these structures or to relocate the rail line around them in order to restore service all the way through to Central Street in Milford from Framingham.

Results of Right-of-Way Inspection

In January 1997, an inspection of the former Holliston Secondary right-of-way between I-495 and Central Street in Milford was conducted by the CTPS project manager for this study. The inspection included a combination of walking on the right-of-way and making observations at former crossing locations where buildings, fencing, or ground conditions precluded walking. From north to south the findings were as summarized below.

The right-of-way under the twin highway bridges at Route I-495 was viewed by looking north from the Beaver Street grade crossing. It was unobstructed except for poor drainage. A curve blocked the view north of the bridges, but a Holliston resident familiar with the area stated that the right-of-way is unobstructed for several miles and is used as a de facto recreational trail.

The right-of-way between Beaver Street and a point opposite the end of South Street was inspected by walking. A high-voltage power line follows the right-of-way from north of I-495 to north of Route 109. There are two pole lines, with sufficient clearance between for at least one railroad track. A short distance south of Beaver Street, a short segment of the right-of-way has been paved over as a small parking lot for a business located on the west side. (This is the at the approximate site where the Stone & Webster study recommended terminating the extension.)

At Route 109, the former highway bridge, which was still in place at least as late as 1981, has been removed, and the road has been lowered to an elevation of about 10 feet above the former railbed. As discussed below, a rail extension south of Route 109 would require a new highway bridge.

South of Route 109, the right-of-way has been completely obliterated for a distance of about 1,500 feet by the parking lot and access lanes of a large shopping plaza. Sighting

between surviving segments on either side of the parking lot, it does not appear that there are any structures on the right-of-way itself. A track in this segment would, however, run between the parking lot and the front of a Star Market. It may be feasible to construct a new right-of-way through vacant land behind the supermarket.

South of the shopping plaza, the right-of-way resumes for a short distance, but is then blocked by a one-story cinder-block garage near the end of South street. This structure would probably have to be removed for a rail extension, but it might be possible to bypass it on adjoining vacant land. The right-of-way south of the garage runs through an earth cut which was impassable because of flooding on the day of the inspection. The remainder of the right-of-way between South Street and Central Street was inspected only at former crossing locations.

The first crossing south of South Street was Hayward Street. There is no obstruction of the right-of-way on either side of this crossing, but curves on both sides limited the distance that could be observed from there.

At Mount Pleasant Street, the right-of-way as far as could be seen to the north is clear, but a long one-story brick building blocks the right-of-way to the south. This building fronts on Beach Street and is used by several small retail businesses. A small parking lot is located between the building and Beach Street, and a service driveway runs between the building and Mount Pleasant Street. Restoration of rail service to Central Street would require demolition of this relatively new building.

On the south side of Beach Street, a short segment of the right-of-way has been paved as a driveway for a mini-storage business. Because of fencing, it was not possible to determine whether any of the storage buildings are directly on the former right-of-way, but a rail extension would, at the least, interfere with the access to these buildings. Pond Street, which formerly crossed the railroad at grade between Beach and Central streets, now dead-ends at the entrance to a warehouse complex that may now obstruct the right-of-way. The former track area in the immediate vicinity of the Central Street Station building is currently vacant.

Evaluation of Commuter Rail Extension From Framingham to Central Street

Given the findings above, it would be difficult, although not impossible restore rail service on the Holliston Secondary further south than the new Rocky Hill Station site proposed in the Stone & Webster study. To determine whether the alternative of full restoration to Central Street should be pursued further, it was analyzed on the basis of the same considerations applied to the other alternatives examined in this study. The results are contained in the remainder of this appendix.

Running Times

Historically, the Holliston Secondary Track never had very high speed limits. In 1950, the overall maximum speed limit on the line was only 35 m.p.h. The scheduled running

time from the Central Street Station in Milford to Framingham Station with six intermediate stops was 30 minutes. As discussed in chapter 3, the 1990 Stone & Webster study assumed that most of the Holliston Secondary could be upgraded for maximum speeds of 60 m.p.h. Lower speeds would be required near the ends of the line, however. If service was restored all the way to Central Street, the speed limit between there and Route I-495 would be 30 m.p.h. This limit would be required because of several grade crossings in a densely developed area, with sight lines restricted by curves. With the speed limits above, the running time from Central Street to Framingham with one intermediate stop in Holliston would be about 20 minutes. At present, the scheduled running times for local trains from Framingham to South Station in the A.M. peak range from 47 to 49 minutes, with an average of 48. Including dwell time at Framingham and with one stop in Holliston, this would make an average time of about 69 minutes from Central Street to South Station. A Milford train running non-stop between West Natick and Back Bay would have a running time of about 56 minutes to South Station.

Comparisons With Travel Times for Other Alternatives

The estimated driving time to the South Station area from the vicinity of Central Street is about 52 minutes, so express and local trains would both have travel times longer than driving. The train time to South Station from a Rocky Hill station would be three minutes less than that from a Central Street station, but for most passengers access time to Rocky Hill would be five minutes longer. Therefore, for an extension from Framingham a Central Street terminal would have a travel time advantage of about two minutes compared with a Rocky Hill terminal. An express train from Central Street via Framingham would be about three minutes faster than an express train from Central Street via Forge Park. A local train via Framingham would be about four minutes faster than a local train via Forge Park.

Level of Service

Scheduling considerations for an extension to Central Street via Framingham would be the same as those for an extension to Rocky Hill. Therefore, a Central Street terminal would have no level of service advantage or disadvantage compared with a Rocky Hill terminal.

Fares

Based on rail distance from Boston, a Central Street station on a Milford extension from Framingham would be in fare Zone 7, as would a Rocky Hill station. From the passenger's perspective, travel cost from both stations would be the same (ignoring the slight added access cost to reach Rocky Hill.) As discussed below, the station location would have an insignificant impact on demand. Therefore, operating revenue for an extension from Framingham would be essentially the same with either a Rocky Hill terminal or a Central Street terminal.

The longer distance to Milford via Forge Park would place a Central Street station on that route in fare zone 8. Passengers boarding at Central Street on an extension from Framingham would therefore pay less than passengers boarding at Central Street on an extension from Forge Park, but the same differential would apply at a Rocky Hill station when compared with Central Street via Forge Park.

Ridership

The assumptions in the manual forecasting procedure used in producing the ridership estimates for this study were not sensitive to specific station locations within a given town. Therefore, on an extension from Framingham the same ridership was predicted at a Rocky Hill station as at a Central Street station if only one of the two were provided. (Elasticity models also indicate that the difference in travel time to Boston from Central Street versus Rocky Hill would have a negligible impact on ridership.)

Capital Costs

The Central Street station site on an extension from Framingham would be 1.5 miles beyond the new Rocky Hill station site assumed for purposes of analysis. On an unobstructed right-of-way, the additional cost of track reconstruction and signal installation over this distance would be about $4,220,000. Because of redevelopment of portions of the right-of-way in the mile nearest Central Street, it would be necessary either to re-route parts of the rail line or to acquire and remove several structures that now block the old alignment. The added costs for either of these strategies were not estimated for this study.

There would be three additional grade crossings on the segment between Rocky Hill and Central Street. The cost of upgrading these would be $620,000. About 11,000 linear feet of fencing would be needed in the densely developed area between Rocky Hill and Central Street, at a cost of $70,000.

Between Rocky Hill and Central Street, the Route 109 bridge over the railroad right-of-way has been removed. The grade of the road has been lowered by about 10 feet at the former crossing location to improve sight lines. This bridge would need to be replaced for an extension continuing to Central Street. The cost of a new bridge and approaches would be about $2,250,000.

A terminal at Central Street in Milford would be within walking distance of more trip origins than a terminal at Rocky Hill would be. With all service to Milford provided by extending Framingham local train trips, 270 parking spaces would be required at Central Street compared with 320 at a Rocky Hill if the line terminated there. With peak-period express and off-peak local service 350 spaces would be needed at Central Street compared with 425 at a Rocky Hill terminal. Therefore, a Central Street terminal would save about $210,000 in parking construction costs with local service or $315,000 with express service compared with a Rocky Hill terminal.

The difference between lengths of extensions to Rocky Hill or to Central Street from Framingham would not affect equipment cycle times sufficiently to change the number of train sets required to operated the service. Since the same ridership is predicted for either terminal, no change in train lengths would be needed.

With allowances for contingencies, engineering, administration, and inspection, the capital cost of a Milford extension to Central Street would exceed that of an extension to Rocky Hill by about $8.9 million with all local service or about $8.8 million with local and express service. The capital cost per new transit rider for an extension to Central Street would be $249,239 with all local service or $188,610 with all local service. For a Rocky Hill terminal the respective costs would be $222,731 or $173,788. Again it must be noted that the capital costs calculated for a Central Street extension do not include extensive property taking and demolition work that would be needed south of Rocky Hill.

Comparison of Operating Costs and Revenue

As discussed above, a Central Street terminal on a Milford extension from Framingham would attract the same number of riders as a Rocky Hill terminal, with no difference in fares. The added distance to Central Street would increase train miles by about 5%, however, with a proportional increase in operating cost. This would reduce the revenue to cost ratio for the extension to about 8.9% with all local service or 11.3% with local and express service.

Environmental and Community Impacts

Air Quality Impacts

Compared with a terminal at Rocky Hill, a terminal at Central Street would require fewer passengers to use some form of automobile access. For passengers accessing the station by auto, average access distance would be shorter at Central Street than at Rocky Hill. Consequently, the weekday VMT reduction for a Central Street terminal would exceed that for a Rocky Hill terminal by 1,365 with all local service or by 1,805 with express and local service. At the same time, the additional rail distance from Rocky Hill to Central Street would increase weekday locomotive emissions by about 5 %. The net impact would be an additional reduction of 0.8 VOC per day with local service or 1.2 VOC per day with express and local service for a Central Street terminal compared with a Rocky Hill terminal. With the capital costs discussed above, the incremental cost per weekday kg of VOC elimination for Central Street versus Rocky Hill would be $11,100,000 with all local service or $7,287,500 with express and local service.

Impacts on Community and Cultural Resources

Between Rocky Hill and Central Street in Milford, the Sacred Heart Cemetery is within 400 feet of the right-of-way, and the Sacred Heart School on Pleasant Street adjoins the alignment.

Traffic Impacts of Station Access

With peak-period express service on an extension from Framingham, the most heavily used train at a Central Street station would have about 110 riders arriving by some form of auto access. In the final minutes prior to train departure, auto arrivals would average about 12 per minute, but not all of these would approach the station from one direction. With local service only, the peak train would generate about 85 auto-access trips to Central Street.

Grade Crossings

The segment of the Holliston Secondary track between the new Rocky Hill station site and Central Street had three grade crossings of public roads. These were at Hayward Street, Mount Pleasant Street, and Beach Street. A future rail extension to Central Street would also have to cross these three streets at grade.

Impacts on Abutters

Land along the abandoned right-of-way between Rocky Hill and Central Street is more densely developed than at north of Rocky Hill. There are about 35 houses within 200 feet of the segment south of Rocky Hill, where no trains have run since 1972. Most of these houses appear to have been built before the rail service ended. Because of normal occupancy turnover, it is likely that a substantial percentage of the residents of the houses built before 1972 did not live there when trains were running, however. Furthermore, in the final years before the line was abandoned it had been used by at most one slow-moving local freight train per day in each direction.

APPENDIX F - ANALYSIS OF ALTERNATE STATION LOCATIONS

Role of Walk-In Potential in Station Site Selection

In the 1993 commuter rail survey, among passengers who reported walking as their mode of access to the outer boarding station, 96 percent reported access times of 20 minutes or less. At typical walking speeds, this would mean that most walk-ins had access distances of under one mile. As will be seen from the discussion below, the number of potential users of a Milford commuter rail extension who would live within one mile of a station would be relatively small. Trip origins would also be too widely scattered to allow for cost-effective feeder services. Therefore, in planning stations for the extension, highway access and parking availability would be of greater importance than walk-in potential.

As discussed in Chapter 4, home-to-work trips ending in either Boston or Cambridge account for 85% of the inbound weekday ridership on the existing commuter rail lines terminating at South Station. Work trips to the Boston Central Business District alone account for 74% of the ridership. It is reasonable to assume that Boston and Cambridge work trips would also be the primary market for a Milford commuter rail extension. Journey-to -Work figures from the 1990 Census show that under 3% of the residents of any town in the probable attraction area of a Milford extension work in Boston Proper, and that under 6% are employed in all of Boston and Cambridge combined. Only Holliston has over 4.5% of its residents employed in Boston or Cambridge.

A circle with a radius of one mile centered on a rail station, representing the walk-in attraction area, would have a total area of about three square miles. If population density were uniform, such a circle drawn in Milford would have enclosed an average of about 175 Boston or Cambridge workers in 1990. Actual population density is about 50% above the town-wide average in the area surrounding the Central Street station site, but density around Rocky Hill is substantially lower than the average.

In Bellingham, a one-mile radius circle would enclose an average of about 85 Boston or Cambridge workers. Population density is higher than the town-wide average in the vicinity of Bellingham Junction, but the number of Boston or Cambridge workers living within one mile of this location is probably 200 or less.

In Holliston, a one-mile radius circle would enclose an average of about 125 Boston or Cambridge workers. Population density in the vicinity of Lowland Street is about twice the town-wide average, but density around a Braggville station site is far below the average.

Not all Boston or Cambridge workers living within one mile of any station site would use commuter rail, and not all of those who did use commuter rail would be willing to walk to the station. As discussed in chapter 6, ridership on a Milford extension under any of the alternatives examined would result in a relatively low ratio of incremental revenue to incremental operating cost. Ridership accounted for by walk-ins at any

potential station site would, in turn, account for less than half of the estimated total boardings.

Identification of specific station sites on a Milford commuter rail extension is beyond the scope of this study. For purposes of analyzing ridership, travel times, and traffic impacts of the extension, however, it was necessary to make some assumptions about approximate station locations. The following sections of this appendix discuss characteristics of past station sites on both alignments, and of new sites suggested in prior studies. Future station locations would not necessarily correspond with any of these.

General Characteristics of Past Stations on Rail Routes to Milford

None of the past station sites on the Milford Secondary Track between Forge Park and Milford or on the Holliston Secondary Track between Framingham and Milford have any remains of platforms, lighting, or parking facilities that would be suitable for future rail passenger service, so construction costs would be similar for these sites or entirely new ones. Most of the past stations were located when the rail lines were constructed in the 1800s. Access then would have consisted mainly of walk-ins with some drop-offs by horse and carriage, so there was no reason to provide for all-day vehicle parking. Traffic levels on the lines never grew sufficiently to call for major station modernization. Off-street parking at stations consisted at best of a few unpaved spaces.

Locations of Past Milford Secondary Track Stations

Historically, when passenger service was operated on the Milford Secondary Track there were three stations on the segment beyond the present Forge Park terminal. (See map on page 15.) Bellingham Junction Station was on the north side of Riverbrook Road in Bellingham, at the point where the Milford Secondary crossed a now-abandoned rail line between Millis and Woonsocket, Rhode Island. This station was also a short distance from Bellingham Center, and from the intersection of state Routes 126 and 140. It was 2.3 miles from the Forge Park site.[25]

The next station beyond Bellingham Junction was called South Milford, but was actually in Bellingham, at Hartford Avenue, west of Depot Street. This location was 1.2 miles from Bellingham Junction and 3.5 miles from Forge Park.

The former Milford Station site on the Milford Secondary Track was on the south side of Central Street in downtown Milford. This location was 3.8 miles from Bellingham Junction and 6.1 miles from Forge Park. (This site is discussed in greater detail in chapter 3.) No traces remain of the Bellingham Junction, South Milford or Milford stations now.

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[25]When Bellingham Junction Station had passenger service in the past, the only station between there and Franklin Station was Unionville, at Grove Street in Franklin. Unionville was about 0.7 miles further from Bellingham Junction than Forge Park is.

Locations of Past Holliston Secondary Track Stations

Historically, there were seven passenger stations on the Holliston Secondary Track, including Milford. (See map on page 15.) Starting from Framingham, the first station was Whitneys, at Whitney Street in Sherborn (mile 2.6). East Holliston Station was at the crossing of Washington Street (state Route 16) in Holliston (mile 4.2). Holliston Station was at Central Street, near the Holliston town center (mile 5.4).

Metcalfs Station was at the crossing of Summer Street in Holliston (mile 7.2). Braggville Station was at the crossing of South Street in Holliston (mile 9.3), near the border of Milford. Rocky Hill Station was at the crossing of Beaver Street in Milford (mile 10.2). Milford Station on this line was on the north side of Central Street, opposite the station on the line from Franklin. Passenger trains were never run through between the two lines, but at one time there were track connections across Central Street for interchange of freight cars. A future Milford extension could incorporate portions of both lines in downtown Milford if that should prove to be desirable.

Although passenger service on the Holliston Secondary Track was operated until 1959, all of the stops except Milford and Holliston were discontinued in 1954, because of low ridership. Few, if any, traces remain of the former stations at Whitneys, Metcalfs, Braggville, and Rocky Hill. An old wooden station building at East Holliston has been converted to a private home. A similar building formerly located at Holliston Station still exists, but has been moved away from the right-of-way. There are no remains of platforms or parking facilities at either site.

The B&A Milford Station at Central Street, a small granite building constructed in 1909, has been recycled for retail use, most recently as a liquor store. No usable platforms remain, however, and the station building would undoubtedly need substantial remodeling for reconversion to transportation use. There is little room for parking on the B&A side of the street, but separation of boarding areas and parking areas by a street is not unprecedented at MBTA commuter rail stations. Alternatively, if a rail line from Framingham were extended as far as Central Street, it could be continued to some point on either the Milford Secondary Track or the Grafton & Upton Railroad where more land is available.

Proximity of Potential Station Sites to Major Highways

Route I-495

The only limited-access highway running directly through towns on a Milford extension on either alignment is Route I-495. This highway runs more or less parallel with the Milford Secondary Track between Forge Park and Milford Center. Stations on an extension from Forge Park could intercept some traffic going toward I-495, but as discussed below, the orientation of the highway is such that it would not be used by significant numbers of passengers for access to stations on the extension.

The existing Forge Park Station is located about one half mile from the interchange of I-495 with Route 140. The 1993 commuter rail survey did not determine the specific routes used for access to stations, but among users of Forge Park from further west, only residents of Milford and part of Bellingham would have been likely to approach via I-495.

A station at Bellingham Junction would be about two miles from the interchange of I-495 with Route 126. Drivers heading for a commuter rail station from points on I-495 north of Route 126 would be likely to stay on I-495 for the additional 2.7 miles to Route 140 to take advantage of the shorter local road link, faster train time, and lower fare at Forge Park compared with Bellingham Junction. Traffic approaching Route 126 from the south on I-495 would pass Route 140 first, leaving no incentive to continue to Bellingham Junction.

The former South Milford Station site in Bellingham is about 1.5 miles from the interchange of I-495 with Route 126. Although this is slightly less than the distance from I-495 to Bellingham Junction, the disadvantages of South Milford compared with Forge Park would be similar to those at Bellingham Junction.

A station at Central Street in Milford would be about 2 miles from the interchanges of I-495 with either Route 109 or Route 85. Both interchanges are within Milford, with Route 85 being the further north of the two. North of Route 85, I-495 does not serve any towns that would be in the service area of a Milford extension. Traffic approaching Route 109 on I-495 from the south would have to pass the interchange with Route 126, and most traffic would also pass Route 140. Therefore, there would be no incentive for this traffic to go to Central Street instead of Bellingham Junction or Forge Park.

A Rocky Hill station on a Framingham extension would be about half a mile from the interchange of I-495 with Route 109. For most Milford residents, access to Rocky Hill would be more direct via Route 109 than via I-495. Like a station at Central Street, a Rocky Hill station would have little attraction for residents of points along I-495 outside Milford.

A Braggville station in Holliston would be 1.3 miles from the interchange of I-495 with Route 109. It would have disadvantages similar to those of other extension stations in attracting traffic from I-495. A Lowland Street station in Holliston would not be close to any limited-access highways, nor would any of the former station sites north of Braggville.

State Highways

The Central Street station site in Milford is about one quarter mile from Route 16, which follows Main Street through downtown Milford. West of there, Route 16 continues through Hopedale, Mendon, Uxbridge, and Douglas. In the demand analysis in chapter 4, all of these were assumed to be in the service area of a Milford extension. Residents of Hopedale would use a Milford station regardless of which alignment was used, but

residents, of Mendon, Uxbridge, and Douglas, would be likely to find Bellingham Junction more convenient if offered a choice. Traffic approaching a Central Street station from the east via Route 16 would originate mostly within Milford.

A Rocky Hill Station would probably be accessed directly from Route 16. For passengers starting from points west of downtown Milford, as most users of a Central Street Station would, a Rocky Hill station would increase access distance by about 2 miles. Sections of Milford close to Rocky Hill have relatively low population density.

Route 16 continues parallel with the alignment of a Framingham extension from the border of Milford as far as East Holliston. A Braggville station would be about one half mile from Route 16. It would be used mostly by residents of the western end of Holliston, who could use Lowland Street if there were only one station in the town, and by residents of the eastern edge of Milford. A Lowland Street station would also be about one half mile from Route 16, but would be used mostly by Holliston residents.

The former Holliston Station site is about 0.25 miles from Route 16; Metcalfs Station was under 0.2 miles from Route 16, and East Holliston Station was directly on Route 16. Lack of sufficient room for parking at these sites would offset the access advantage compared with Lowland Street, however.

The Holliston Secondary track passes directly through Sherborn for a distance of about two miles, but the only road that crosses it there is Whitney Street. The former Whitneys station was located at this crossing, but Whitney Street is narrow and winding, and would be poorly suited for use as an access route to a commuter rail station built to present-day standards. The nearest state highways to this location are Route 126, about 0.7 miles to the west, and Route 16, about 1.4 miles to the southeast.

On a Forge Park extension, a Bellingham Junction station would be within half a mile of Route 126, near the intersection of Route 140. Route 126 would be used for access from Bellingham itself, and from Blackstone and Woonsocket to the south. From points north of Bellingham on Route 126, use of a Bellingham Junction Station would involve too much backtracking to attract many riders. Route 140 would be used for portions of access trips to Bellingham Junction from Mendon, Uxbridge, and Douglas to the west, but traffic from the east would continue to go to Forge Park.

The former South Milford station site is about one half mile from Route 140, which is the nearest numbered highway. South Milford would be slightly more convenient than Bellingham Junction for trips originating in Mendon, Uxbridge, and Douglas, but these are predicted to account for under 20% of the boardings at Bellingham Junction.

APPENDIX G - RIDERSHIP ESTIMATION METHODOLOGY

Chapter 4 of this report describes the travel markets expected to be served by a Milford extension, and summarizes the predicted ridership from these markets. This appendix provides further details on the methods that were used in estimating ridership.

Extension Share of Boston Proper Work-Trip Market at 1990 Travel Levels

The share of the Boston Proper work-trip market captured by the existing commuter rail lines varies widely among the cities and towns served. These differences can be attributed to many underlying causes, but are influenced strongly by the range of options available to residents of these communities. In general, among cities and towns with direct commuter rail service, the highest rail market shares are found where average rail travel speeds are highest, highway access to Boston is poorest, no other direct transit alternatives are available, and rail access is unconstrained by parking capacity. Rail typically also attracts higher market shares as travel distance from Boston increases.

A Milford extension would be either a continuation of the Franklin Line or a branch of the Framingham/Worcester Line. Both of these lines terminate at South Station and also serve Back Bay. Milford trains run via Forge Park could also stop at Ruggles Station, but for scheduling reasons it is unlikely that all would. Passengers on an extension via Framingham would need to transfer to the Orange Line at Back Bay to reach Ruggles.

Based on Census and survey data for communities on existing South Side lines, a Milford extension with peak-period express service and unconstrained parking could be expected to capture about 50% of the work trips to Boston Proper from its on-line towns. In general, commuter rail captures smaller shares of trips from cities and towns without stations than from those with direct service, but there are exceptions. These are most likely to occur in cases where direct transportation service to Boston by modes other than rail is inconvenient but there is good access to a rail station in a nearby town. These conditions would apply in most of the Milford extension service area. Therefore a 50% factor was applied both to the on-line towns and to most of the off-line Milford corridor communities.

As discussed in chapter 2, the service area of a Milford extension from Forge Park would consist of Milford, Bellingham, Hopedale, Mendon, Uxbridge, Douglas, Blackstone, Woonsocket, Rhode Island and the southern half of Upton. The 1990 Census results show a total of 1,070 Boston Proper work trips from this area. A 50% share of this market would equal 535 trips.

For an extension from Framingham, the service area would be similar to this, except that Holliston would be included and Bellingham, Blackstone, and Woonsocket would not be. The 1990 Census results show a total of 1,020 Boston Proper work trips from this area. A 50% share of this market would equal 510 trips.

Extension Share of Other Boston and Cambridge Work-Trip Markets at 1990 Travel Levels

Using procedures similar to those used for estimating Boston Proper work trips, it was concluded that a Milford extension with peak-period express service could be expected to capture about 20% of the work trips from its service area to destinations either in Boston outside Boston Proper ("other Boston") or in Cambridge. (Travel to most such destinations by commuter rail would involve a transfer to an MBTA rapid transit or bus route.) For the service area of an extension from Forge Park, the 1990 Census results show totals of 800 work trips to other Boston and 285 to Cambridge. A 20% share of these would be 215. For the service area of an extension from Framingham, the 1990 Census results show a total of 725 work trips to other Boston and 275 to Cambridge. A 20% share of these would be 200.

Extension Share of Other Travel Markets

In the preceding sections, the estimated number of work trips to all of Boston and Cambridge that would be captured by a Milford extension from Forge Park would total 750. On an extension from Framingham, the comparable total would be 710. The 1993 survey results show that for the South Side lines as a whole, work trips accounted for 89% of all trips with final destinations in Boston or Cambridge. Applying the same factor to the estimates for a Milford extension from Forge Park results in an estimated 95 non-work trips to Boston or Cambridge, or a total of 855 trips for all purposes. For an extension from Framingham, there would be 90 non-work trips to Boston or Cambridge, or a total of 800 trips for all purposes.

The survey results also showed that for South Side lines as a whole, 96% of all non-interzone trips (i.e. all trips either to or via South Station, Back Bay or a station in zone 1A or 1B) for all purposes were destined for Boston or Cambridge. With similar proportions, Milford service via either route would be expected to attract about 35 non-interzone riders with destinations outside Boston or Cambridge.

Interzone ridership accounts for under 1% of weekday trips on present South Side lines. This may, however, be more a reflection of the locations of rail stations relative to suburban trip attractions than of inherent unattractiveness of commuter rail for suburb-to-suburb travel. For a Milford extension, interzone travel possibilities would differ depending on which alignment was used. Therefore, separate factors were estimated for the two extension alignments, as described below.

On the Franklin Line, only 0.4% of passengers in the 1993 survey were making interzone trips. For passengers boarding at stations on an extension of this line to Milford, Forge Park Station would be an additional possible inbound interzone trip end. Although an office park is being developed around this station, with the relatively short distance from Milford (6 miles) this would be unlikely to change the interzone trip potential of the extension significantly from the pattern on the existing line. At this rate, only 5 interzone trips would be expected to originate at stations on a Milford extension.

The Framingham/Worcester Line offers slightly more interzone trip attractions than the Franklin Line. In the 1993 survey, 1% of all Framingham/Worcester Line passengers made interzone trips. At the time of the survey, the line ended at Framingham, so that town was not a possible destination for inbound interzone trips. It would, however be a possible destination for passengers boarding at stations on a Milford extension through Holliston. A February 1995 survey of passengers boarding at Worcester Station after commuter rail service was extended there found 1.5% making interzone trips to Framingham. These findings suggest that the overall interzone trip potential of a Milford extension on this alignment would be around 2.5% of total ridership. At this rate, about 20 interzone trips would be expected to originate at stations on a Milford extension. The difference in interzone trip potential between the two possible Milford extension alignments would, by itself, be too small to be a deciding factor in the route selection. Estimates for both alignments may be high, as completion of some interzone trips would require transferring between express and local trains.

A Milford extension could also serve some reverse-commuting trips. Based on the experience on existing Boston commuter rail lines, these would not be a significant ridership component even with anticipated new development such as a National Guard headquarters in Milford. A high proportion of present reverse commuting trips by rail are made by students attending colleges or private schools near rail stations rather than by workers, but Milford has no schools that would have large numbers of students commuting from other towns.

The most likely operating scenarios for a Milford extension would include few, if any, trains with arrivals in Milford at times suitable for common work shifts or school sessions. At existing stations in older downtown areas similar to Milford, even when there are several outbound A.M. peak arrivals and several inbound P.M. peak departures, reverse-commuting trips usually total no more than 30 to 35 per day. Stations in similar areas but with only one outbound A.M. peak arrival typically serve fewer than 10 reverse commuters per day. A Milford extension would not necessarily provide even one outbound A.M. peak arrival, and would be unlikely to provide more than one.

In the trip categories discussed above, trip purposes are defined by purpose at the inner end, so the return halves of reverse-commuting trips would not be classified as work trips. Since a Milford extension would not have an unusually large number of reverse-commuting trips, the various factors used above for non-work trips should be sufficient to account for reverse commuters.

The Rocky Hill station site on a Milford extension from Framingham would be near an existing hotel. Additional hotel development in Milford along I-495 is anticipated. Some advocates of a Milford commuter rail extension have suggested that these hotels would generate additional ridership not accounted for by the demand forecasting procedures used for this study. Registration information does not usually reveal what locations are being visited by hotel guests other than those registered in groups attending conventions or other special events. Because of the distance from Milford to

Boston, however, it seems unlikely that a large percentage of guests at hotels in Milford would be Boston or Cambridge visitors.

Distance aside, Milford is not along a direct line of travel to Boston from any major origins so far away as to require overnight lodging when visiting Boston. It is also not along a direct line of travel to Boston from any major airports. The Mass. Turnpike, which is the main highway into Boston from the west, bypasses Milford by about 10 miles. Interstate 95, which is the main highway into Boston from the south , bypasses Milford by about 15 miles. Most Boston visitors arriving by highway would therefore have to make large diversions in their routes to stay in Milford hotels. For these reasons, commuter rail ridership to Boston by guests in Milford hotels would be too small to require separate calculation in the demand estimates.

Estimated Ridership Without Express Service

Total ridership estimated above from stations on a Forge Park-Milford extension to all destinations for all trip purposes adds up to 885. On an extension from Framingham, the total would be 855. Both figures are based on service including express trains during peak hours. Without express service ridership would be lower, as discussed below.

As shown in Table 3-1, express trains on a Milford extension would provide line-haul travel times ranging between 7 minutes slower and 9 minutes faster than driving times to Boston from the vicinities of the extension stations. Local trains would have travel times ranging from 4 to 21 minutes longer than driving times. As a result, express service would be much more likely than local service to divert travelers who would otherwise drive. Present transit users who would be likely to shift to stations on a Milford extension with express service would also be likely to shift to an extension with local service. Local service would offer about the same overall travel times as present alternatives, but would have more convenient access for those in its service area.

Ridership for a Milford extension was first calculated for the express service alternatives, using the procedure described above. The portion of this ridership that would be diverted from present transit service was then estimated on the basis of Census data and survey results. On an extension from Forge Park, an estimated 570 of the 885 riders would be present transit users, so 315 would be new transit users. On an extension from Framingham, an estimated 450 of the 855 riders would be present transit users, so 405 would be new transit users.

Travel times to Boston from most points on the existing commuter rail system are longer than driving times, but survey results show that the majority of passengers are licensed drivers who have cars available for their trips. Therefore, even with local train service, stations on a Milford extension should be able to capture some share of trips now made by driving. For purposes of analysis, it was assumed that with only local service the number of auto diversions would be half the number with express service. This resulted in estimated total boardings of 725 on a Forge Park extension or 655 on a

Framingham extension. Reducing auto diversions by plausible factors other than 50% would not change the revenue-to cost-ratios of the local service alternatives sufficiently from those discussed in chapter 6 to affect conclusions as to their viability.

Ridership Changes from 1990 to 1996 and Future Years

As discussed above, work trips to Boston would account for the largest portion by far of ridership on a Milford commuter rail extension. Therefore, in estimating ridership in future years, it is most important to examine changes in work travel. The most comprehensive information on work trips is that provided by the U.S. Census Journey-to-Work survey. This is conducted in conjunction with the regular decennial Census, so the most recent figures available are from 1990. Some changes in travel patterns would be expected in the years since these figures were collected, and institution of commuter rail service implies a relatively long-term investment in fixed facilities. Thus, it is important to update the 1990 figures both to the present and to various future years.

Adjustment from 1990 to 1996

Between census years, the Census Bureau prepares estimates of population for states, counties, and municipalities at two-year intervals. Town-level figures are based largely on a sampling of information contained in income tax returns. The estimation process takes considerable time to complete. The most recent estimates are for population as of July 1, 1994, and these were released in the fall of 1995. These estimates do not include any journey-to-work information.

The Census population estimates for towns in the Milford extension service area, further extrapolated to 1996, indicate overall population growth of about 7.5% since 1990. Combined population in the towns that would be served directly, and would account for the largest shares of ridership, increased by under 2%, however. Furthermore, as a result of economic conditions, overall Boston and Cambridge employment was essentially the same in 1996 as in 1990. Since work trips to Boston and Cambridge would be the predominant source of ridership on a Milford extension, it was concluded that forecasts based on 1996 conditions would not differ significantly from those using the 1990 data.

Projected Demand for Year 2020

In the 1990 Census tabulations, Boston alone accounted for 86% of the combined Boston and Cambridge employment among residents of the Milford extension service area. In the 1990/1996 demand forecasts, Boston accounted for 92% of the combined Boston and Cambridge work trips using a Milford extension. Therefore, future ridership growth would depend primarily on growth in Boston employment among residents of towns served by the extension.

Changes in the number work trips to Boston and Cambridge between 1990 and 2020 have not been officially projected by town of origin. The Metropolitan Area Planning

Council (MAPC) projects an overall employment increase in the city of Boston between 1990 and 2020 of about 5%. The projected increase in population for the MAPC Region as a whole over the same time span is also about 5%, but the expected rates of change vary widely among cities and towns. Given the similarity in projected growth rates between overall Boston work trips and overall regional population it is likely that work trip changes by town would be most similar to population changes.

Of the municipalities assumed to account for most Milford extension trip origins, Milford, Bellingham, and Holliston are in the MAPC Region. Milford and Bellingham accounted for 64% of the Boston and Cambridge work trips from all towns in the service area of a Forge Park extension in 1990. Milford and Holliston accounted for 83% of the Boston and Cambridge work trips from all towns in the service area of a Framingham extension. MAPC projects overall population increases of about 7% for Milford, 14% for Bellingham, and 13% for Holliston between 1990 and 2020. The other Massachusetts towns in the extension corridor are in the Central Mass. Regional Planning Commission District. Population for this district as a whole is projected by the Massachusetts Institute of Social and Economic Research to increase by 22% between 1990 and 2020.

In this study, ridership estimates for a Milford extension for the year 2020 have been calculated by assuming that the numbers of residents of towns in the extension service area employed in Boston or Cambridge will increase at about the same rates as total town populations, and that the commuter rail shares of travel from these towns will remain constant. Under these assumptions, year 2020 boardings at stations on an extension from Forge Park with local service would be 810 per day, including about 180 new transit users. With peak-period express service, year 2020 boardings on the extension itself would total about 1,010, of which about 355 would be new transit users. These totals would represent increases of 10 to 15% from ridership at present travel levels. In addition, the express service would attract about 200 new transit users to existing Franklin Line stations by 2020. Peak-period express service from Forge Park with local trains from Walpole but no Milford extension would attract about 250 new transit users to the Franklin Branch by 2020. This would be an increase of 25% from present travel levels, reflecting higher projected population growth in the service area of the existing Franklin Line than in the expected service area of a Milford extension.

Assuming ridership growth proportional to population growth, boardings at stations on a Milford extension from Framingham in the year 2020 with local service at all times would total about 735. This would include about 230 new transit users. With peak-period express service, year 2020 boardings on the extension itself would total about 965 of which about 455 would be new transit users. These totals would represent increases of 12 to 14% from ridership at present travel levels.

Because of stable population levels in the service area of the portion of the Worcester/ Framingham Line that would be affected by Milford service, the number of new transit users attracted to existing stations by the year 2020 would be about the same as under existing conditions. As discussed in chapter 4, this would total about 105 new riders with local service only, or about 135 with peak-period express service.

APPENDIX H - HISTORY OF MILFORD EXTENSION CORRIDOR PUBLIC TRANSPORTATION SERVICE

Past Rail Passenger Service

Milford Secondary Track

Forge Park Station has been the outer terminal of the Franklin commuter rail line since 1988. Prior to that, service had terminated at Franklin Station, 2.9 miles closer to Boston. Franklin Station had become the terminal in 1966, when MBTA subsidization of service on the line began. Before that, trains continued to the town of Blackstone via a route different from the one serving Forge Park.

Passenger service to Milford via the Milford Secondary Track was last operated in 1920, and consisted then of a combined passenger and freight train from Franklin. Operation of separate passenger and freight trains on the line ended in 1917, and had included no schedules suitable for Boston commuting since 1904. Further details on the history of this route are set forth below

The Milford Secondary Track is made up of sections of two railroad lines built at different times. The 3.8-mile segment between Bellingham Junction and Milford originally opened in 1868, as the Milford & Woonsocket Railroad. Its main purpose was to provide passenger and freight service between the two industrial communities in its name. Between Bellingham Junction and Woonsocket (6.6 miles) traffic of the M&W was carried over the Woonsocket Division of the Boston, Hartford & Erie Railroad, which had been completed in 1863. There was no attempt to schedule passenger service on the M&W for travel between Milford and Boston via the Woonsocket Division.

From 1868 to 1883, the M&W was operated under lease by the Providence & Worcester Railroad, with which it connected indirectly at Woonsocket. In 1872, the Hopkinton Railroad opened an 11.7-mile route from the M&W at Milford through Hopkinton to the Boston & Albany Railroad at Ashland. Passenger service on this line, also leased to the Providence & Worcester, was scheduled to provide Boston connections via the B&A rather than via the M&W.

In 1883, the Milford & Woonsocket began operating as an independent short line, and also took over operation of the Hopkinton Railroad. Later in 1883, the M&W leased the newly opened Milford, Franklin & Providence Railroad, which ran from Bellingham Junction to Franklin Junction (4.7 miles). The MF&P made up the remainder of today's Milford Secondary Track. (The name Milford Secondary is used for the Franklin Junction-Milford Line in the remainder of this section, although that designation dates only from 1969.) At Franklin Junction, the MF&P connected with the Blackstone Division of the New York & New England Railroad, an 1875 reorganization of the Boston, Hartford & Erie. Portions of the Blackstone Division make up today's MBTA Franklin and Fairmount lines. The M&W and the NY&NE immediately established

through passenger service between Boston and Milford via Franklin Junction. The M&W system was leased to the NY&NE in 1887.

The New York & New England Railroad was reorganized in 1895 as the New England Railroad. The New York, New Haven, & Hartford Railroad (New Haven Railroad) had a controlling interest in the New England, and leased it in 1898. The main line of the New England Railroad's Blackstone Division crossed the Main Line of the New Haven's Boston & Providence Railroad on a bridge at Readville. In 1899, in conjunction with the opening of South Station, a track connection was built at Readville to allow trains from the Blackstone Division to enter Boston via the B&P as well as via the Fairmount line, and the New Haven began gradually shifting trains to the new route.

Passenger service between Milford and Boston via Franklin Junction was never very successful. When it was started, there was limited demand for service to Boston from Milford, and there was already well-established faster service on the route to Boston via Holliston and Framingham. In 1901, a trolley line was completed between Franklin and Milford paralleling the Milford Secondary Track, and drawing off local passenger traffic. By 1904, the New Haven had reduced passenger service on the Milford Secondary to two round trips a day, both during off-peak hours.

In 1911, the New Haven Railroad and the Boston & Albany established a new Milford Circuit line, with through trains running from Boston to Milford via Franklin Junction and returning via Ashland or vice-versa. Two trains in each direction made the full circuit, and two trains each way ran from Boston to Franklin via Milford and Ashland. (Most of the service suitable for Boston commuting from Milford ran via Ashland rather than Franklin.) This service was halted in 1914 as a result of anti-trust action against the two railroads. Thereafter, passenger service on the line between Milford and Ashland was reduced to a less-than daily mixed train (a freight train with a passenger car attached.) Passenger service between Franklin Junction and Milford was also downgraded to a mixed train by 1919. Mixed train service on both segments ended in 1920.

Passenger trains began operating again between Bellingham Junction and Franklin in 1926, when through service between Boston and Woonsocket via Needham and Bellingham Junction was re-routed to Franklin. This service gradually dwindled and ended in 1938. It resumed for a few months in 1940, then ended permanently. This was the last passenger service on the Milford Secondary until the implementation of the Forge Park extension.

The segment of the Hopkinton Branch between Ashland and Hopkinton was abandoned in 1938. The track was cut back from Hopkinton to a quarry in North Milford in 1953, and to an industrial area along Summer Street in 1959. Freight trains last ran north of Central Street about 1981.

The Woonsocket Division track between Millis and Woonsocket was abandoned in several stages, beginning with the segment south of Bellingham Junction in 1934. The

segment from Bellingham Junction to Caryville station in Bellingham was abandoned in 1941. The end of the line was further cut back to West Medway in 1949 and to Millis in 1967. Much of the abandoned right-of-way has been obliterated by redevelopment. The remainder of the line north of Millis is owned by the MBTA and is still used for freight service. (A commuter rail extension from Boston to Millis is being examined in a separate study.)

The New Haven Railroad maintained passenger service between Boston and Blackstone via Franklin until 1966. (After 1938, all service on this line used the Boston & Providence route north of Readville.) In 1966, the New Haven was granted permission by the Interstate Commerce Commission to discontinue passenger service between Readville and Blackstone. The MBTA, which had been established in 1964, had previously reached an agreement with the New Haven to subsidize this service if the ICC granted permission to discontinue it. The segment of the route between Norfolk and Boston was within the MBTA district, but Franklin and Blackstone were not. By law, the MBTA was allowed to provide service outside of the district only if it was funded by another entity. The town of Franklin agreed to fund service between there and Norfolk, but because of low ridership the town of Blackstone declined to provide a subsidy. This resulted in the permanent discontinuance of passenger service south of Franklin. The track between Blackstone and a point just west of I-495 in Franklin was abandoned and torn up in 1969.

Since 1966, the MBTA has contracted with a succession of railroad companies to operate passenger service between Boston and Franklin. Since 1987, Amtrak has been the contractor. The tracks have been owned by the MBTA since 1973. In the early 1980s, consideration was given to restoring passenger service between Franklin and Blackstone. This plan was dropped when the developers of the Forge Park complex in Franklin offered the MBTA a station site on the Milford Secondary Track west of I-495. Most Franklin Line trains have run through to Forge Park Station since June 1988.

The New Haven Railroad was merged in 1968 into the Penn Central Company. Penn Central freight operations in Massachusetts were taken over in 1976 by Conrail. Freight service on the Milford Secondary is still operated by Conrail. A previously announced takeover of freight service on this line by Railtex, an operator of regional railroad systems, has been canceled as the result of the planned buyout of Conrail by the CSX and Norfolk Southern rail systems.

Holliston Secondary Track

The rail line now known as the Holliston Secondary track was originally the Milford Branch of the Boston & Worcester Railroad. It was opened between Framingham and Holliston and 1847, and completed to Milford in 1848. In the early years, passengers traveling to Boston from points on the branch had to transfer to connecting trains at Framingham. Through service between Milford and Boston via Framingham was established in the 1880s, possibly in response to the establishment of through Boston-Milford service via Franklin.

The Boston & Worcester Railroad merged in 1867 with the Western Railroad, forming the Boston & Albany Railroad (B&A). The B&A was leased in 1900 to the New York Central system. The maximum service level ever operated on the Milford branch was reached around 1912, when there were 5 through Boston trains and 5 connecting trains each way on weekdays. Passenger service on the branch was discontinued in 1959 because of low ridership.

In 1961 the B&A was merged into the New York Central. The New York Central merged in March 1968 with the Pennsylvania Railroad, as the Penn Central. As a condition of the merger, Penn Central acquired the assets and service of the New Haven Railroad in December 1968. Under Penn Central, the former B&A route to Milford was identified as the Holliston Secondary Track, and the former New Haven route to Milford as the Milford Secondary.

Penn Central declared bankruptcy in June 1970. To reduce costs, the company began abandoning lightly used lines. The segment of the Holliston Secondary between Milford and the Metcalfs section of Holliston was abandoned in June 1972. The segment between Framingham and Metcalfs was taken over by Conrail in 1976. Freight service south of the former General Motors assembly plant site in Framingham was discontinued about 1995 because of lack of demand, but the track is still in place.

Local passenger service on the former B&A main line between Framingham and Boston has been subsidized by the MBTA since 1973. Service between Framingham and Worcester was discontinued in 1975 because of low ridership and lack of a funding source, but was reinstated in 1994.

Grafton & Upton Railroad

The Grafton & Upton Railroad (G&U) has always been an independent short line. It runs from a connection with the Framingham/Worcester commuter rail line at North Grafton 15.4 miles through Grafton, Upton and Hopedale to downtown Milford. The end of track in Milford is beside the Conrail Milford Secondary near Central Street. Although it is legally an active railroad, the segment of the Grafton & Upton between Milford and West Upton has not been used for many years because of lack of demand.

The segment of the G&U between North Grafton and Grafton Center originally opened in 1874 as the narrow-gauge Grafton Center Railroad. It was standard-gauged in 1887, and renamed the Grafton & Upton in 1888. The G&U was extended from Grafton Center to West Upton in 1889, and to Milford in 1890.

Passengers traveling via the G&U to points beyond North Grafton or Milford always had to change to trains of other lines. Connections were oriented mainly for travel to or from Worcester, although travel to or from Boston was also possible.

Passenger service over the full length of the G&U was provided by steam trains until 1902. At that time, the segment from North Grafton to Hopedale was electrified, and

passenger service began being run with trolleys under contract with the Milford & Uxbridge Street Railway. This service ran between Hopedale and Milford via the present Route 16 rather than on the G&U itself. It lasted until 1928. Since then, there has been no passenger service of any kind on the G&U. At present, freight service is operated only on the portion of the G&U between North Grafton and West Upton. Tracks are still in place on the rest of the line, but have been paved over at grade crossings.

The geographic orientation of the G&U would make it unsuitable as a route for commuter rail service between Boston and Milford. If service were extended to Milford via another route, part of the G&U might be used for a further two-mile extension to Hopedale. This possibility should be kept in mind when selecting a station site in Milford, as some locations would require trains to reverse direction before proceeding to Hopedale.

On a route via Framingham, the Milford station would have to be no further south than Depot Street to avoid a backup move to continue on the G&U. For a direct approach from the route via Forge Park, the Milford station would have to be no further north than National Street, and a new connecting track would be required. An extension over the G&U much further than Hopedale would be too indirect to attract many riders. Of the towns assumed to be in the service area of a Milford extension, Hopedale, Upton, Mendon, Uxbridge, and Douglas could all be served more conveniently by a station in Hopedale than by stations in Milford, Bellingham, or Holliston. Ridership from these towns would not increase significantly from the levels shown in Table 4-1, however. A Hopedale station would not attract riders from any towns other than these.

Past and Present Bus Service

Milford-Boston Through Route

The through bus route between Milford and Boston has been operated by the Brush Hill Transportation Company since August 1973, when the previous operator went out of business. Funding of this route under the MBTA/EOTC Interdistrict Transportation Service (IDTS) program began in September 1987. The present service level of two round trips per day has been in effect for most of the time since then, except for an experimental increase to three trips in 1988. The maximum level of service provided on the route after 1973 was seven inbound and six outbound trips, plus an outbound short-turn to West Medway.

In addition to the present route, from 1974 to 1984 Brush Hill operated a route from Milford to Boston via I-495 and the Mass. Turnpike, with no intermediate stops. The schedule for this route was always one inbound A.M. peak trip and one outbound P.M. peak trip. The scheduled running time from Milford Center to Park Square was initially 45 minutes, but had been increased to 50 minutes when service was discontinued. Passenger counts taken in 1977 showed that an average of 35 riders per day boarded the limited-stop trip in Milford. At that time, the route that is now used had a combined

total of only six Milford boardings on four A.M. peak departures. The same four trips plus two West Medway short-turns had 174 passengers boarding at stops closer to Boston, however. The express trip and one round trip on the present route were experimentally extended beyond Milford to Bellingham from 1977 to 1978, but attracted almost no riders there. Reinstituted express bus service from Milford to Boston via I-495 and the Mass. Turnpike would provide travel times similar to those of the fastest rail alternative to Milford.

Bus service between Milford and Boston via Routes 109 and 128 and the Mass. Turnpike was first established in 1967, as a variation of an older route that used Route 109 south of Route 128 but followed local streets from Route 128 via Forest Hills Station to downtown Boston. The running time from Milford to South Station via that route was 90 minutes. The older routing was discontinued when Brush Hill took over Milford service in 1973.

Through Milford-Downtown Boston bus service originated in 1938, in place of a Milford-Charles River Loop (West Roxbury) route, in operation since 1928. The latter route was, in turn, a replacement for trolley service that had been established in the early 1900s.

Milford-Framingham Local Route

The bus route between Milford and Framingham is currently operated as part of the town of Framingham's Local Inter Framingham Transportation (LIFT) system. The town has received funding for this route through the IDTS program since 1990. From 1987 to 1990, the MBTA contracted directly with a private carrier for operation of the route. The collection and distribution area in Framingham has been expanded greatly since the route was added to the LIFT system.

Buses on this route originate at Main and School streets in downtown Milford, at the same location as the Brush Hill Milford-Boston route, and follow state Route 16, Medway and Beaver Streets, and Route 16 again, to the center of Holliston. Route 126 is followed from there through Ashland to the Framingham commuter rail station. From there, buses follow a circuitous route stopping at several malls in Framingham and Natick, including Shopper's World.

Bus service on the segment of this route between Milford and the Framingham commuter rail station has been operated by a succession of bus companies since 1928. This was a replacement for a trolley line that had been operating since 1896. Service was always intended mainly to provide local transportation rather than to act as a commuter rail feeder. The route was first extended through from Framingham Station to Shopper's World in 1970. (Prior to that, it had been possible to make the same trip by transferring to another bus route at Framingham Station.)

The diversion over Medway and Beaver Streets in Milford, which now serves a shopping mall and a hotel, was implemented in 1972, in place of the original alignment

on Route 16. (This diversion also runs close to the possible Rocky Hill station site on a rail extension from Framingham.)

Discontinued Holliston-Boston Through Bus

At present, there is no bus service running through to Boston from any point in Holliston. The most recent such service operated in the past was an experimental route run for a few months in 1995. This route was run by Peter Pan Bus Lines, with funding from the MBTA, as part of an agreement to compensate Peter Pan for riders lost to the Worcester commuter rail extension. Little information is available about the routing or scheduled travel times, but ridership was apparently very low.

From about 1970 to 1973, Holliston was served by a variation of the Route 109 Milford-Boston express bus route discussed elsewhere in this study. One trip per day in each direction was diverted between downtown Milford and Millis via Route 16 south of Holliston Center, and via local streets from there back to Route 109. No ridership figures for this service are available.